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DECEMBER 1954

THURSTON SCOTT WELTON, M.D., EDITOR

Papers of The American Society of Maxillofacial Surgeons

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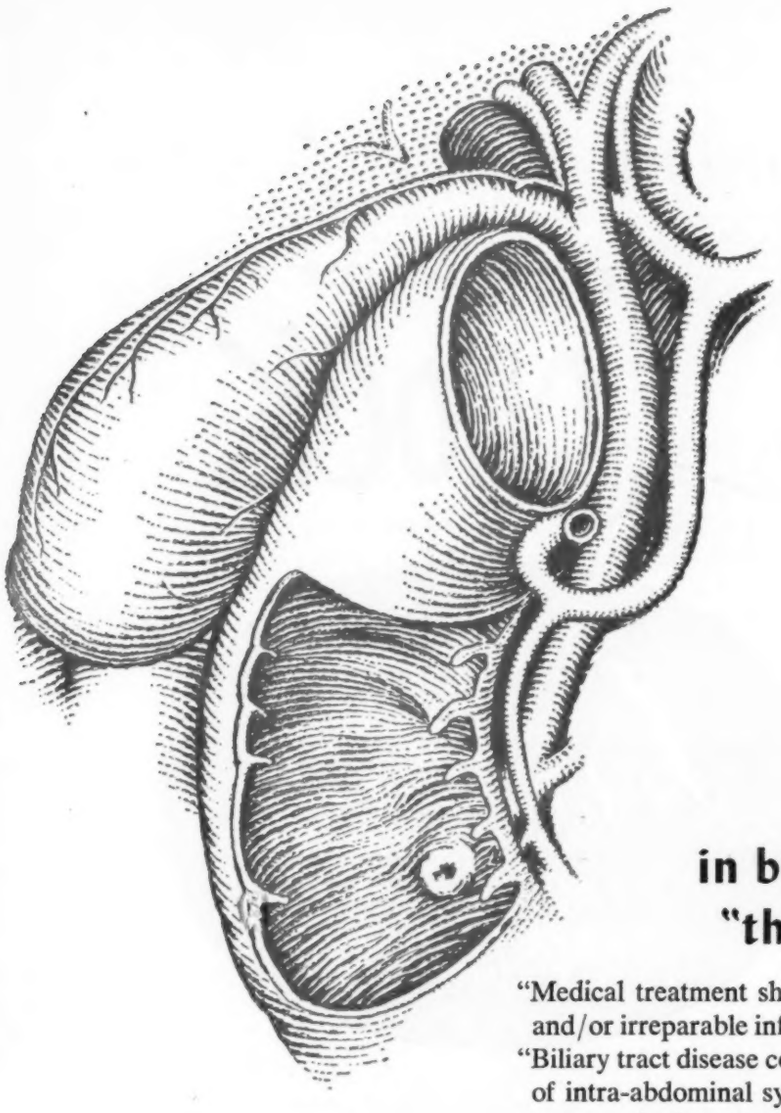

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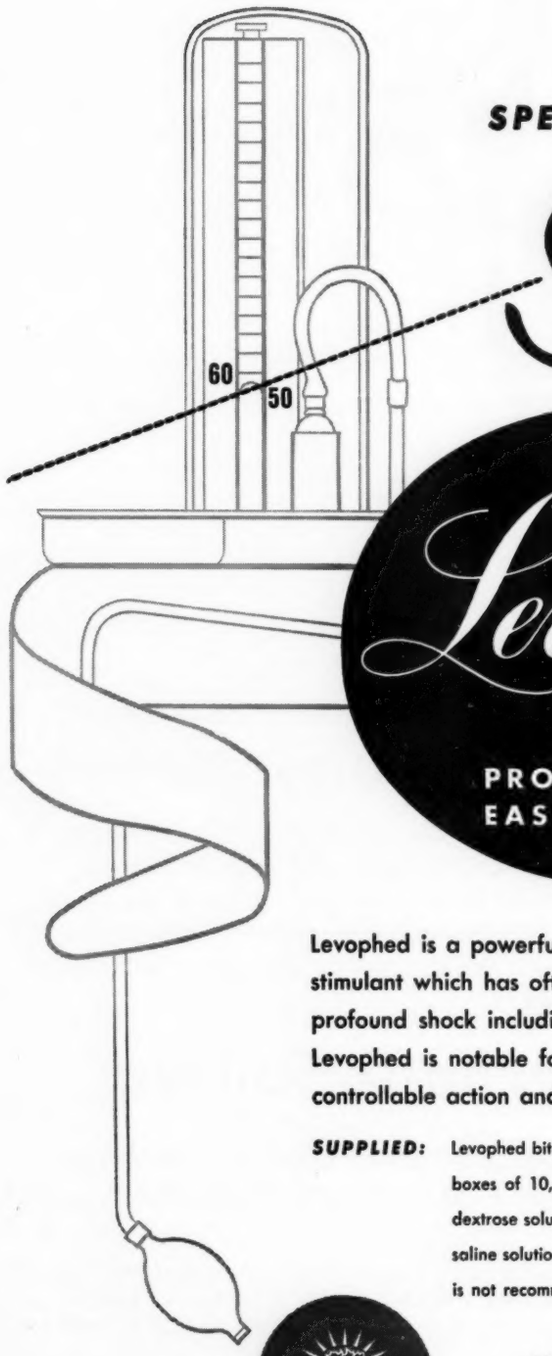

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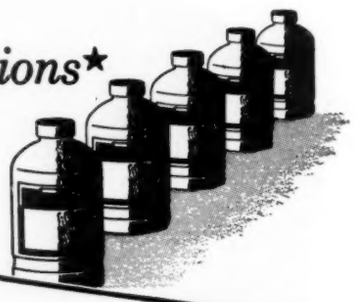

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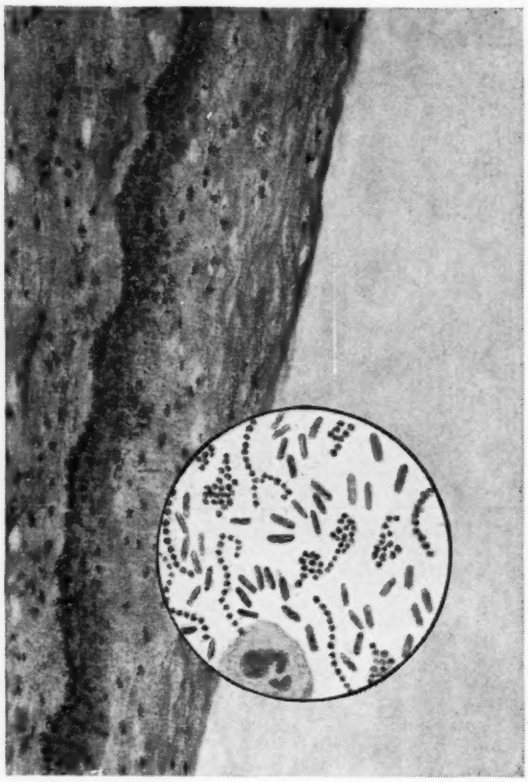
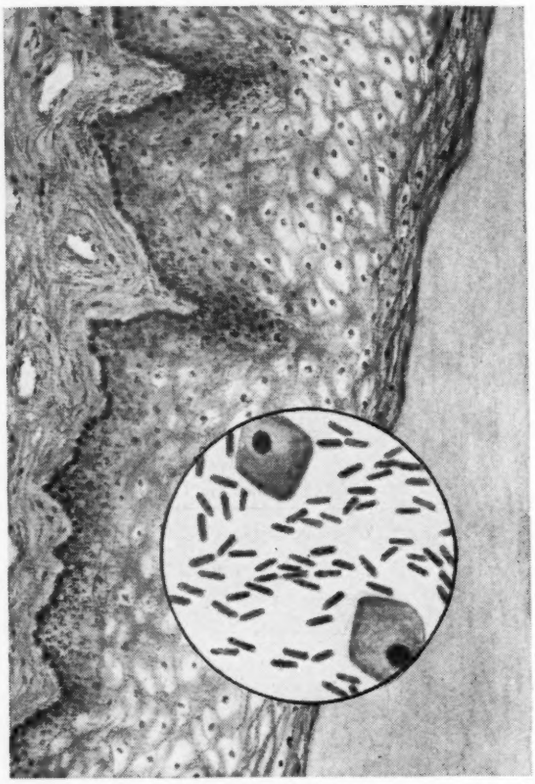


Senile vaginal epithelium is low in glycogen, low in acid and (inset) low in protective Döderlein bacilli, encouraging growth of pathogenic organisms.



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Every attempt should be made to differentiate tumor simulating hypertrophic gastritis from carcinoma of the stomach. The majority of patients will respond to medical treatment. Rarely is gastrectomy indicated. Report of a case.

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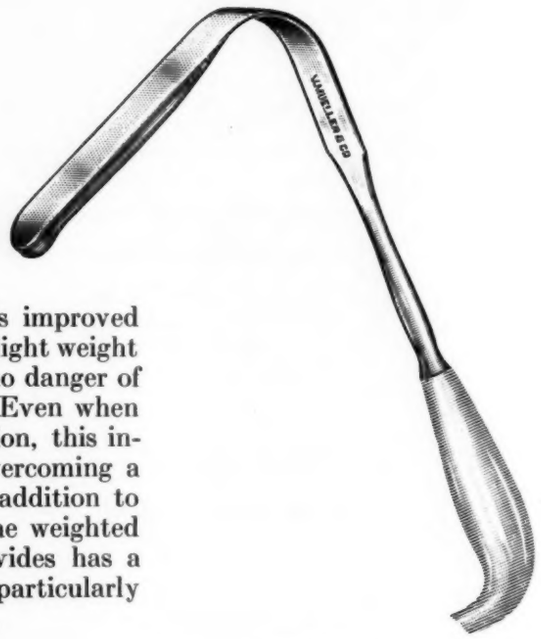
A NEW RETRACTOR

To Facilitate Vaginal Hysterectomy Through Simpler Exposure— Less Bleeding

By ROBERT J. GLENNER, M.D.
Chicago



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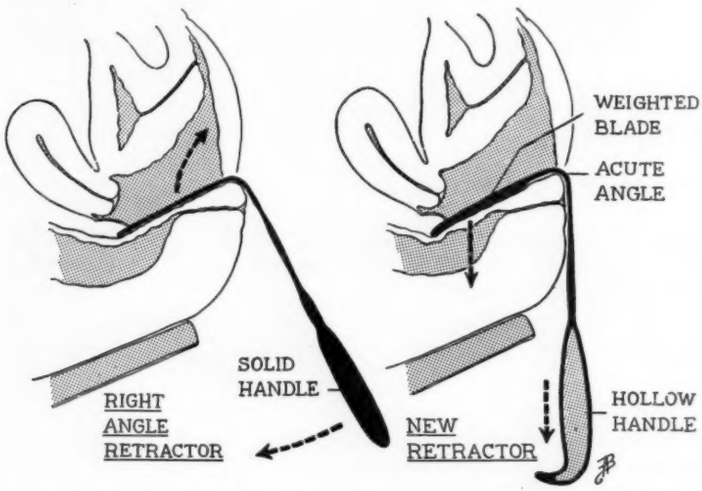

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LT. COL. ROBERT M. HARDAWAY AND CAPT. HOWARD LOCKWOOD

The author describes a case of cystadenoma of the pancreas with surgical removal, and presents a brief review of the literature.

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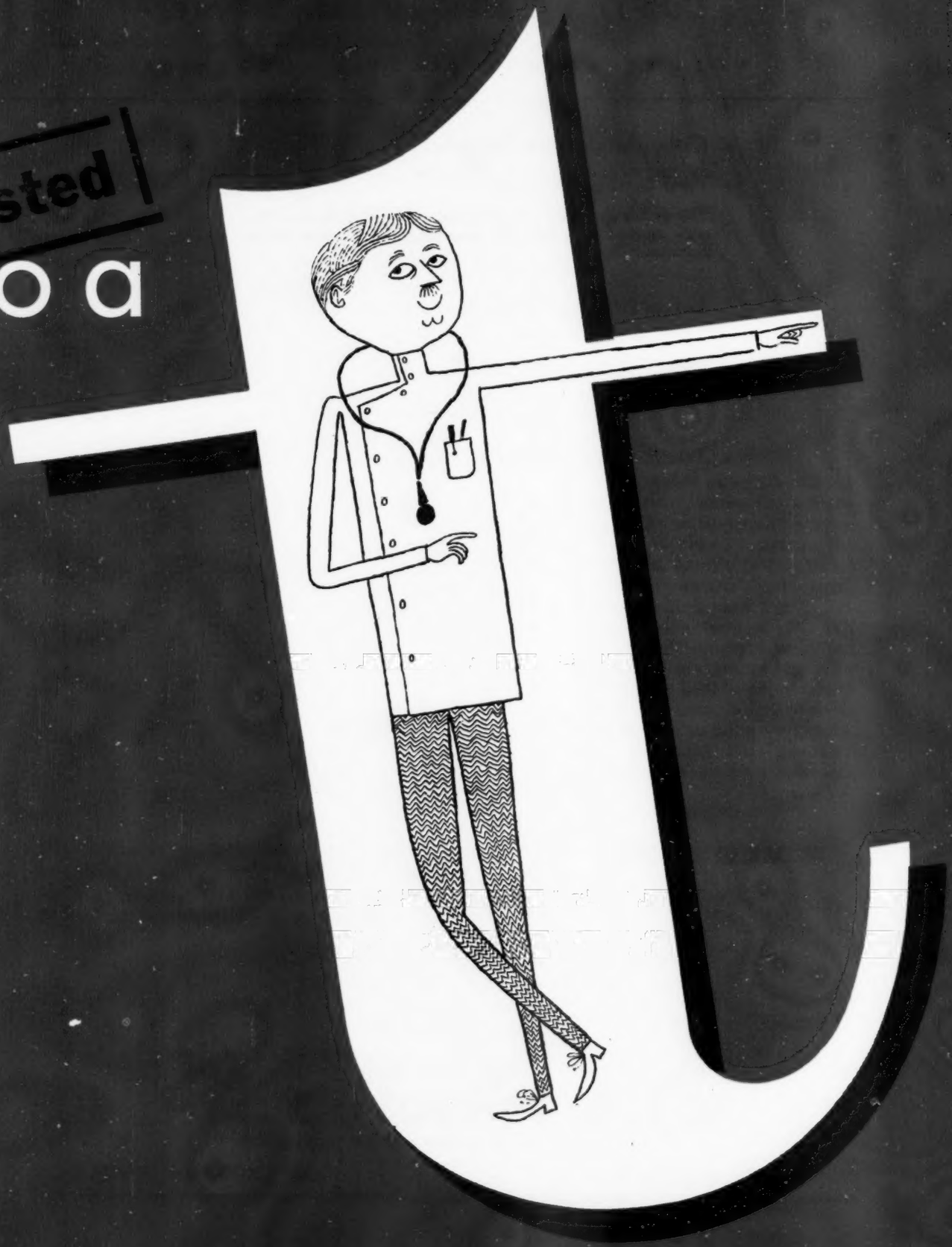

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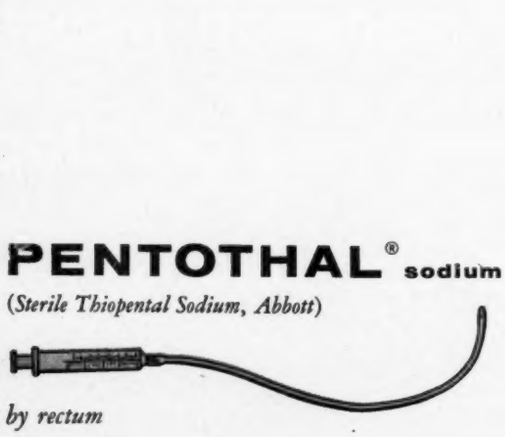

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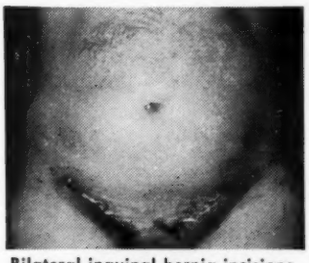
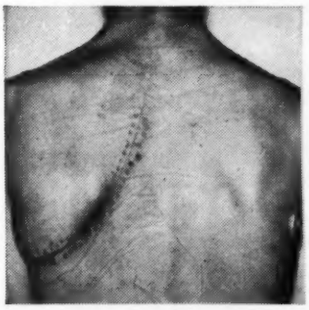


Bilateral inguinal hernia incisions protected by Aeroplast 4th post-operative day.[1]



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1. Rigler, S. P. and Adams, W. E.: Experience with a new sprayable plastic as a dressing for operative wounds, Surg. 36:792 (Oct.) 1954. (University of Chicago Clinics, Chicago, Surgical Service).

2. Choy, D. S. J.: Clinical trials of a new plastic dressing for burns and surgical wounds, Arch. Surg. 68:33 (Jan.) 1954. (Bellevue Hospital, New York, Third Surgical Division—Dr. John Mulholland, chief).

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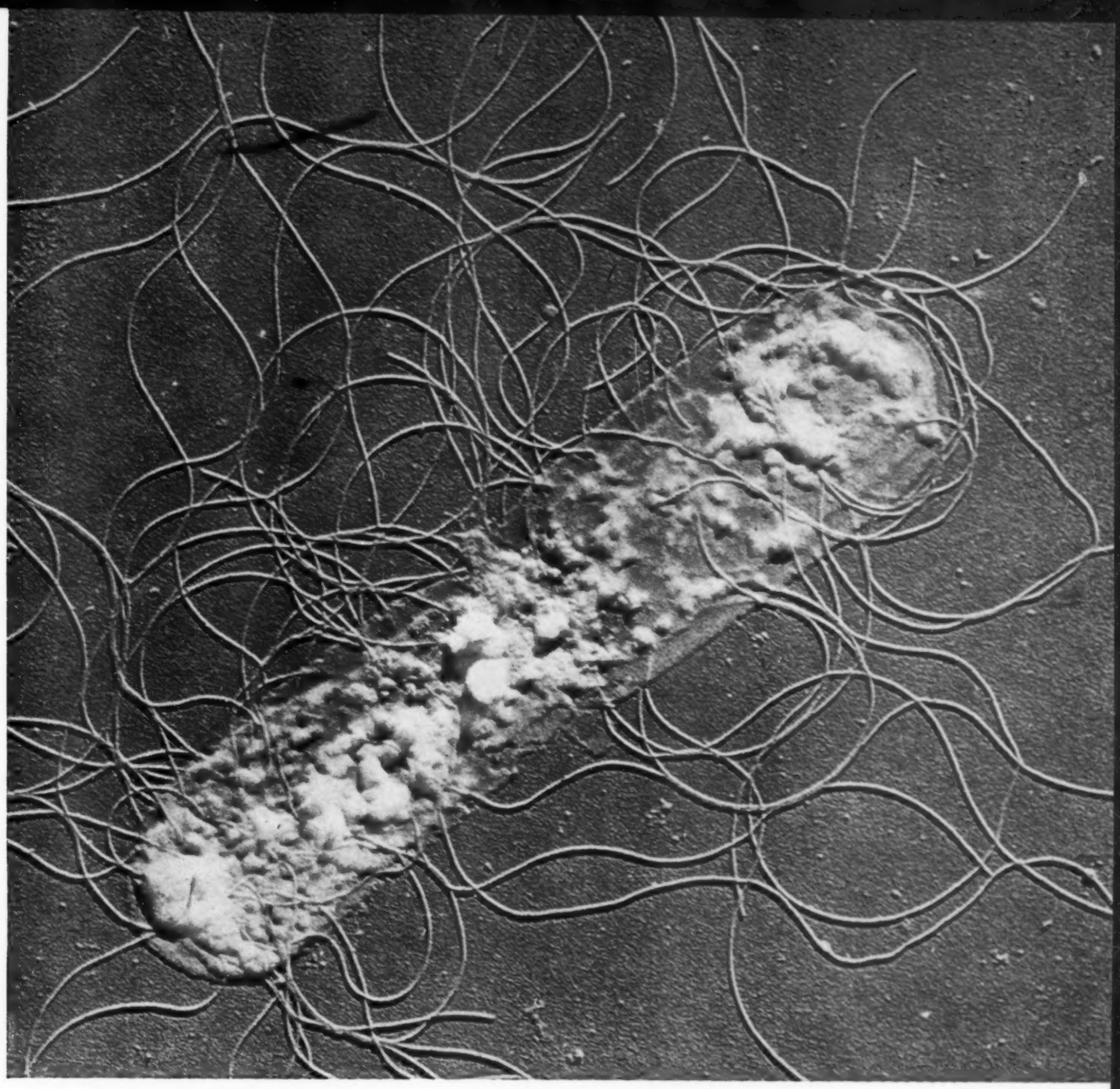

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Evidence indicates that long continued extremely low fat intake in adults is incompatible with good health.[4,a] In addition to protecting tissue protein against catabolism for energy needs (the protein-sparing action of fat), sufficient amounts of fat in the dietary promote storage of protein.[4,b] In a normal mixed diet, fat is about 95 per cent as efficient as carbohydrate for production of muscular work.[4,c]

Neither the optimal level of fat in the diet nor the optimal range for apportionment of fat and carbohydrate to meet calorie allowances is known.[1,2]

Contrary to general impressions, fat in the mixed diet is effectively digested.[4,d] In moderate amounts it does not appreciably influence the digestibility of other foods.[5] Fat enhances the satiety value of meals, and foods naturally containing fat and those prepared with fat add much to the flavor value of meals. High fat diets sometimes are useful in alleviating constipation.[6]

Meat, according to its kind and cut, provides variable amounts of fat which contribute importantly to the body's need for fat. The fat of meat is almost completely digested. Meat also supplies valuable amounts of high biologic quality protein, B vitamins, and essential minerals. Skeletal muscle meat contains less than 0.1 per cent of cholesterol.[7]

---

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American Meat Institute

Main Office, Chicago... Members Throughout the United States

ELECTRON PHOTOMICROGRAPH

Salmonella paratyphi B 32,000 X

Salmonella paratyphi B (Salmonella schottmuelleri) is a

Gram-negative organism which causes

food poisoning • chronic enteritis • septicemia.

It is another of the more than 30 organisms susceptible to

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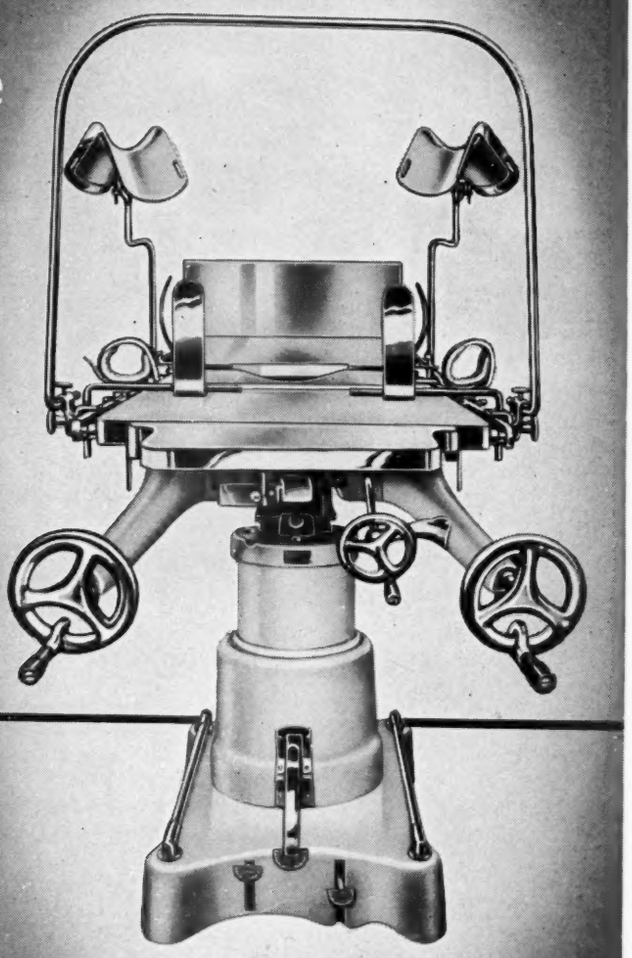

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Joseph, M.: Am. J. Surg. *87*:905, 1954

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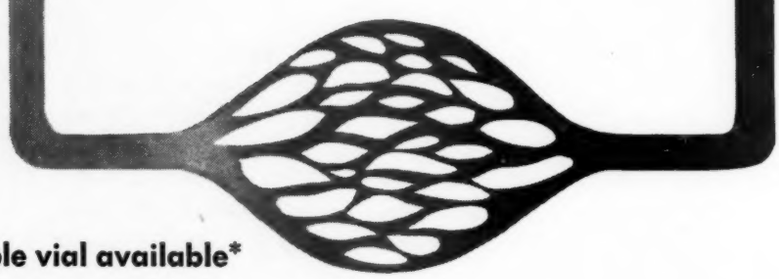

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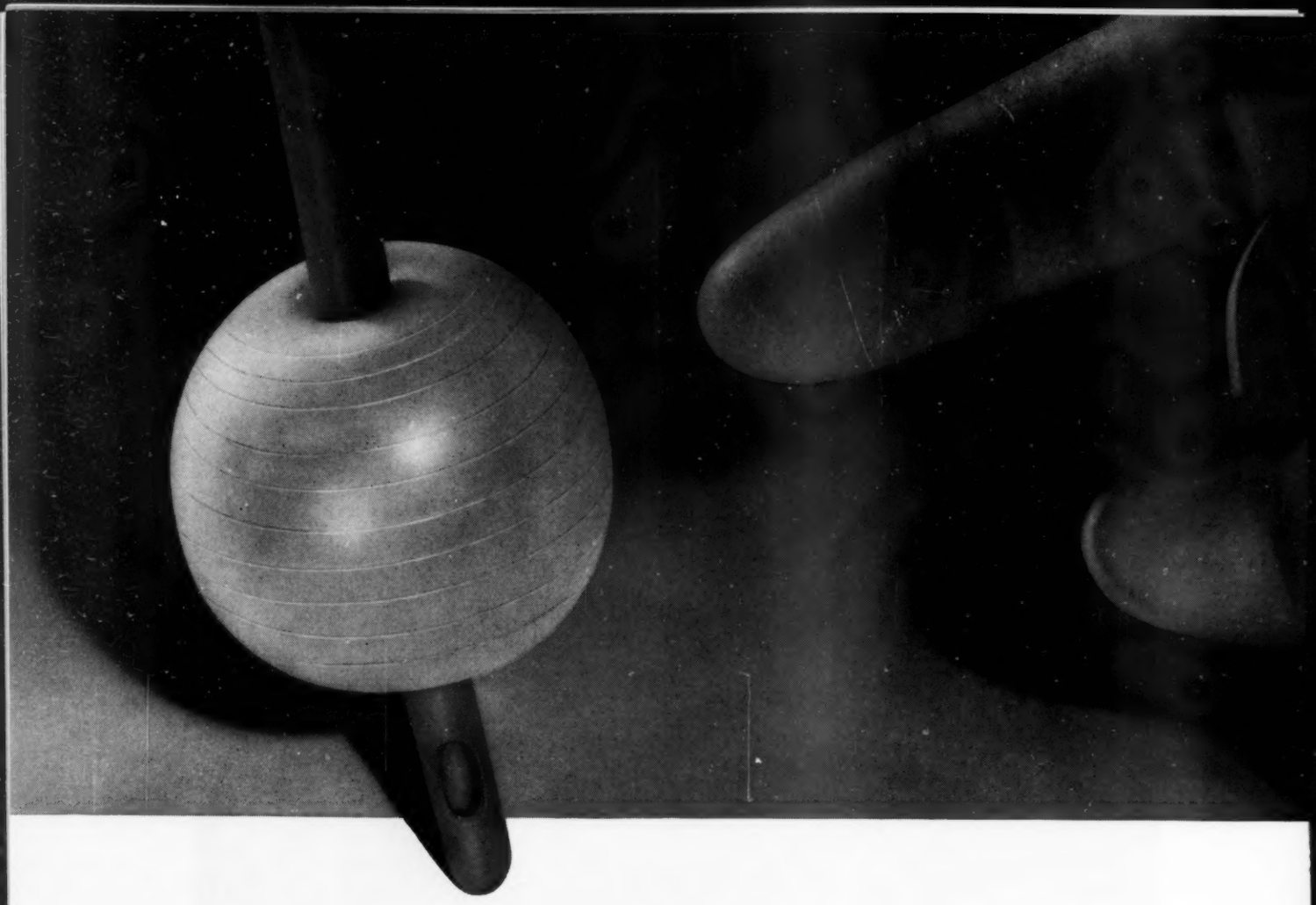

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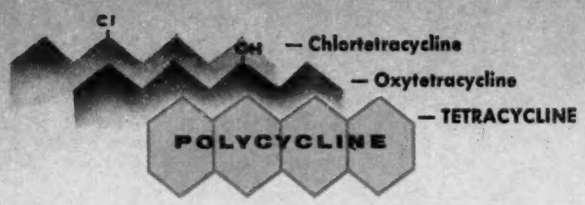

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When you think of Tetracycline, think of POLYCYCLINE

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It is another of the more than 30 organisms susceptible to

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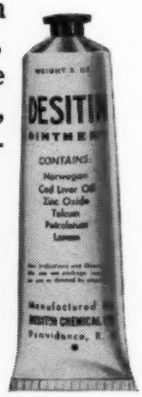

samples and reprint[1] on request

DESITIN CHEMICAL COMPANY
70 Ship Street, Providence 2, R. I.

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  Riboflavin ..... 3 mg.
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  Folic Acid ..... 1 mg.
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1. Watt, B.K., and Merrill, A.L.: Composition of Foods—Raw, Processed, Prepared, United States Department of Agriculture, Agricultural Handbook no. 8, 1950.
2. Data furnished by the Laboratories of The American Institute of Baking, Chicago, Illinois.
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4. Flour and Bread Enrichment, 1949-50, The Committee on Cereals, Food and Nutrition Board, National Research Council, 1950.

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RIBOFLAVIN	0.23 mg.	14%	0.09 mg.	6%
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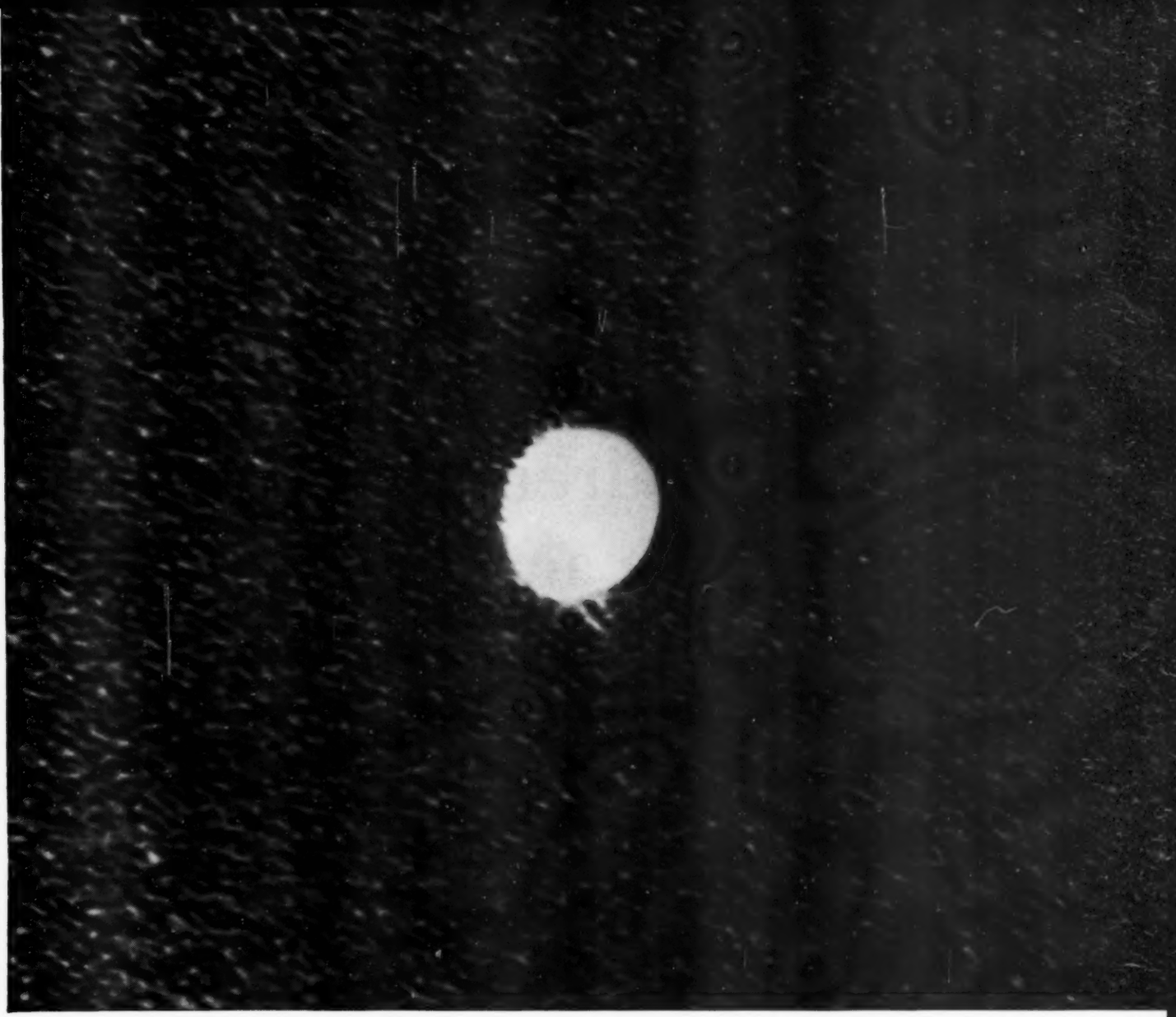

ELECTRON PHOTOMICROGRAPH

Staphylococcus aureus 35,000 X

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It is another of the more than 30 organisms susceptible to

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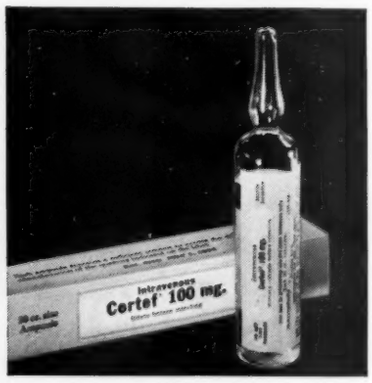

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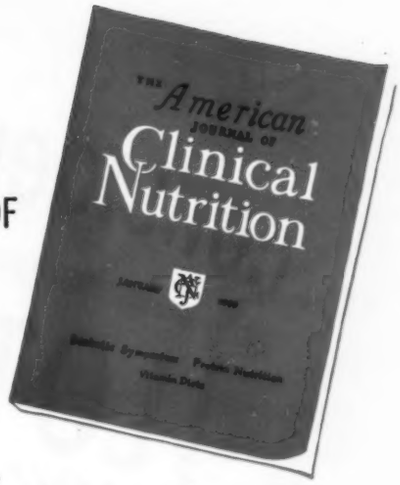

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VOL. 88 DECEMBER 1954 NUMBER SIX

SYMPOSIUM ON MAXILLOFACIAL SURGERY

Ameloblastoma*

FRANK S. BUTLER, M.D. AND WILLIAM F. HARRIGAN, D.D.S., M.D., *New York, New York*

AMELOBLASTOMA is a unique tumor, primary in bone, most frequently involving the mandible. It is rarely seen by the medical practitioner but is observed not infrequently by the dental profession. Tumor clinics have more experience with the recurrent and massive regrowths, whereas the oral surgeon treats this disease in its early dimensions. The authors represent both ends of this spectrum and believe there is need for additional evaluation of this disease entity as a cooperative unit. With this broader scope of experience, therefore, this paper is an effort to limit unnecessary radical treatment and extend the ultraconservative opinions.

Ameloblastoma should not be considered a malignant tumor, and the oft-used term "locally malignant" is an admission of inexperience and inadequate therapy. The diagnosis should be made early, and in most cases is recognized in its early extent. Why then do we have therapeutic failures? Perhaps more important is what constitutes a therapeutic failure. Inasmuch as the disease is localized, we might consider the failure of therapy in its relation to the disabling effect to the patient. Perhaps the patient might consent to a functioning jaw with a multicystic-appearing tumor in preference to a poorly functioning resection. Two important factors make it necessary for complete understanding of this neoplasm. First, of prime importance is the exact histologic verification. There are many variables in the cellular pattern; and unless diagnostic confirmation is obtained, the therapy is misled. Second, the follow-up must be considered sufficiently. Too often a report will include a number of cases but only a small percentage represent the actual experience by the author. Dogmatic statements for and against conservatism, and for and against radical treatment indicate an author's limited experience. This is not a form of criticism, but rather indicates the desirability to consider this disease over a broader scope of investigation. No one, including ourselves, has an abundance of

* Read at the Annual Meeting of the American Society of Maxillofacial Surgeons, April 25 to 28, 1954, Washington, D. C.

personal experience with this tumor, yet we do represent both sides of the controversy.

We are not dealing with malignant disease and it is questionable that true ameloblastoma has or will develop malignant features. There are numerous cases on record that have existed for years without malignant degeneration and we do not believe that treatment should be directed toward the rare exceptional deviation. Why not evaluate therapy on the basis of conclusions from both sides of the whole story?

Ameloblastoma as described in Rathke's pouch, the long bones and ovaries is not discussed in this paper, and we reserve the right to question the diagnosis in these unusual primary sites. Our experience with this tumor in the maxilla has been too meager for contribution. Therapy should be sufficiently adequate to eradicate the tumor with full consideration for the functioning jaw. The rare exception from a distant site of origin or with invasive features must be considered an eccentric.

AMELOBLASTOMA (ADAMANTINOMA)

This was first described by Louis Charles Malassez, a physiologist in Paris, who noted residual epithelium rests as small groups of enamel epithelium in embryonal as well as adult jaws. The term adamantinoma is used loosely. The tumor is not hard as the name implies, and no enamel is described except by a small minority including Ewing, who reported portions of enamel found in the lesion. Ameloblastoma is the more popular name, suggesting that the tumor originates from the enamel organ epithelium or the enamel-forming cell, the ameloblast. However, the enamel-forming cell is not the basic cell in all tumors. Aisenberg states the ameloblastoma arises from epithelium endowed with the potentiality of odontogeny; and while there are many variants of the tumor, the cell type tends to mimic the ameloblast. Byars and Sarnat suggest preameloblastoma because the tumor arises from the enamel organ before the ameloblasts have differentiated. Zegarelli prefers the term adamantoblastoma because it indicates the possible cells of origin. This name includes all types of epithelial forms which may develop from the multipotential embryonic enamel-forming cells. Coley pictures a relationship clinically as well as histologically with the adenocystic basal cell epitheliomas. Schulenburg also mentions the similarity and suggests the name basal cell carcinoma of the jaw.

Schulenburg delivered the Hunterian Lecture on adamantinoma in 1951 and reported 872 carefully selected cases of tumor of the jaw in South Africa, eighty-eight of which were adamantinoma. The average age was thirty to fifty years when first seen, 80 per cent in the lower jaw, males slightly higher in sex incidence. Grimes and Stephens reported 85 per cent in the lower jaw. Robinson reported an average age of thirty-eight and found 84 per cent mandibular tumors. He analyzed 379 cases and found the distribution slightly higher in females. Geshickter and Copeland's figures correspond with those of Robinson and added a higher incidence in the colored race. Byars and Sarnat reported 400 cases in which the average age was thirty-eight and both sexes were equally represented.

Histology. The dental anlage is an inward proliferation of the oral epithelium that is first identified between the sixth and seventh weeks of intrauterine life. The dental papilla is formed by the adjacent connective tissue, the interaction of both resulting in tooth formation. It is the basal cells of the enamel organ in apposition with the dentinal papilla which differentiates into ameloblasts. Development of the dentinal matrix stimulates ameloblastic activity and results in the formation of enamel matrix. Ameloblastomas develop when the ameloblasts proliferate without participation of the mesenchyme. The cell type will vary, however, from a tall columnar to a low cuboidal form, with occasional squamous metaplasia and rarely pigmentation. Since the oral epithelium has the potentiality of developing several types of adult structure (namely, squamous cells, mucous glands, salivary tissue, enamel organs, etc.), we can expect all gradations of epithelial tumors. Histologically, therefore, an ameloblastoma has two or three types of epithelial structures. The ameloblastoma appears to parallel that of the normal enamel organ up to the point at which it becomes functional. From here the enamel organ progresses to form enamel while the neoplasm degenerates to a non-functional mass.

Etiology. In an attempt to support mainly the incidence in the long bones, Kyrie states the tumors originate from basal cells of the skin which as a result of injury become implanted in bone. Anderson and Saunders say

the bone environment in which the basal cells are implanted is the determining factor in their differentiation into ameloblasts. Too often, however, the cortex and periosteum are intact, making it difficult to visualize implantation of epithelial elements. Willis states the ameloblastoma of the tibia is a bone-infiltrating carcinoma, parts of which resemble the ameloblastoma. Similar lesions in the hypophysis are assumed due to migrating oral epithelium which undergoes metaplasia into ameloblasts.

Zegarelli investigated seventy-nine cases of the ameloblastoma in mice of the Maude Slye Colony at the University of Chicago and showed the tumor origin from a group of cells constituting the outside layer of the enamel organ. This author also considers the odontogenic cyst to be stages in the development of the ameloblastoma. Thoma and Proctor state the early adamantine changes develop as projections from the surface of a cystic epithelium and progress either into the lumen or into the fibrous capsule and the surrounding marrow spaces. The case described by Carpenter and Thoma clearly demonstrates a cyst with both the papillary projections and the proliferations into the connective tissue.

At present the more acceptable etiologic factors are: (1) residual epithelial rests (Malassez described small groups of enamel epithelium in embryonal as well as adult jaws); (2) mucous membrane epithelium of the jaw (advocates incriminate the basal layer of the epithelium of the gum which invades the bone); (3) epithelium of odontogenic cysts (typical ameloblastic tissue has been clearly demonstrated in the wall of a cyst of the jaw); and (4) malformed and supernumerary tooth germs.

Clinical Behavior. The symptoms of the early ameloblastoma do not exist. Frequently they are exposed through routine x-rays of the jaw. Careful history will reveal that the patient had the tumor at least several years. The age incidence, therefore, does not indicate how long the tumor existed prior to detection.

A slow progressive expansion of the jaw is the most common symptom. Infection, ulceration and fistula are not common but do occur, as well as pathologic fracture. Often the patient is first seen by the general practicing dentist who suspects underlying disease after extraction of a tooth. The oral surgeon is then consulted who suspects the diagnosis after the x-ray is taken. Expansion is toward the buccal surface rather than the lingual, but the jaw function is maintained. Initial involvement is more frequently in the body of the mandible near the angle, but continued growth is in both directions. The tumor is irregular in shape and frequently cystic. The arbitrary division into solid and cystic types may be confusing since careful examination of the specimen will show both solid and cystic areas grossly and microscopically.

The roentgenographic appearance of the ameloblastoma is not diagnostic. Dr. S. S. Wald, Clinical Professor of Radiology at the New York University College of Dentistry, objects to the lesion diagnosed as a multiloculated cyst, and rightly so because the tumor is not a multiloculated cyst. A multiloculated cystic appearance resembling a honeycomb or soap bubble structure is suggestive but requires histologic proof. This x-ray appearance can be shared by fibroma, giant cell tumor, osteogenic sarcoma, fibrosarcoma and metastatic carcinoma from the thyroid, breast and kidney. A high percentage of correct diagnoses can be made from the x-ray study and a careful history, however. From an etiologic consideration, it is suggested that every cyst wall be examined microscopically.

The incidence of malignant degeneration has not been fully reported and therefore is somewhat confusing. Byars and Sarnat in their report of 400 cases stated that 4.5 per cent showed metastases. In a case report Catlin merely mentioned the figures from Memorial Hospital in New York City. Of fifty-one cases, two showed metastases, one to the regional nodes and the other to the lungs. A report of 196 cases by McFarland and Patterson revealed two that showed metastases and added that the ameloblastoma, no matter how benign it appears histologically, may occasionally produce distant metastases. Waterworth reported the case of a fifty-seven year old sheep-herder in whom a neck node developed fifteen months after local treatment, and lung metastases after twelve years. Thus we have reports that this tumor can be malignant without evidence of spread, that it can metastasize via the local and distant lymphatics, by way of the blood stream, and also by implantation (Vorzimer and Perla). Schweitzer and Barnfield mention thirty-two cases from the literature which were considered malignant but ten showed metastases. Bradley Coley reported on a fifty-five

year old Negro woman who noted the tumor at the age of nineteen, had numerous operations followed by local spread and died forty-eight years later with metastases to the lungs, liver and kidneys. Geshickter and Copeland state the adamantinoma may be looked upon as a neoplastic and potentially malignant homologue of the follicular cyst, but that the growth is slow, extending from five to fifty years. Schulenburg mentions an interesting case of a seventy year old patient who had four surgical excisions from 1918 to 1947, and after thirty years of recurrence showed no definite signs of malignancy. This case is similar to our own patient A. M. who has had five local excisions over an interval of almost twenty years without evidence of distant or extensive local spread. However, another case of ours (patient J. G.), and perhaps the only case on record, had a rapid massive recurrence within three months but without evidence of distant spread.

One office requested that we give histologic confirmation of eight cases they were treating as ameloblastoma. Careful study revealed that two were tumors unrelated to the ameloblastoma.

Since a histologic relationship appears to exist with salivary tissue tumors and basal cell epitheliomas, undoubtedly there will be the exceptional misbehavior. In retrospect, all clinical types of the ameloblastic tumor do exist, althought rarely, and perhaps a reclassification may help to find a more uniform pathogenesis.

TREATMENT

The suggestion for treatment will depend on the surgeon's experience. If the massive regrowth is referred to him following several curettings, he will advise radical resection and decry the conservative attempts. If he sees the disease remain localized after simple excision, he may criticize the radical procedure. I overheard one participant of a discussion state that some cases of gastric cancer have been cured by a subtotal gastrectomy, but total gastrectomy is the accepted surgery. This is an unfair contrast, however, because we are not dealing with a malignant disease. The ameloblastoma is a benign tumor where a small percentage of doubtful histologic types run a variable and unpredicted course. Amputation is not done for Paget's disease of bone although some areas develop osteogenic sarcoma. An intestinal surgeon does not perform colectomy for an adenomatous polyp, nor is a regional node dissection performed with excision of a pigmented nevus. The recurrence rate for mixed salivary tumor of the parotid gland is high, but no one suggests radical parotidectomy. There is incontrovertible evidence that ameloblastic tissue occurs in the odontogenic cyst. Must we resect for every cyst?

Conservatism does not imply inadequate excision, and complete excision does not include mandibulectomy in every case. It is hoped that complete excision for the early case will give less and less referrals for radical resection. Treatment should be adequate for complete eradication of the tumor tissue, and inasmuch as this disease is seen in its early and localized state, adequate removal will minimize the necessity for mandibular resection.

Adequate excision cannot be performed intra-orally or with a local anesthetic. An extra-oral approach with incision in the submandibular region will give good exposure. Since the mass projects toward the buccal surface, and with the help of x-rays, the area can be identified clearly. The external maxillary vessels are ligated and cut separately if encountered, and the mandibular branch of the facial nerve is to be avoided. The mass and adjacent bone including the periosteum must be removed. Segmental excision of bone may be necessary, but the early case can be eradicated with the continuity of bone retained. We are not convinced that cauterization of the bony defect is necessary.

A large extensive tumor will require resection, but a resected jaw has lost its normal function regardless of the present methods for reconstruction. Normal function can be maintained only when there is continuity of bone. Once the continuity is interrupted, mastication is reduced to a soft diet. When the lateral jaw is removed, the cosmetic deficiency is not great; however, a serious cosmetic defect is created when the resection is necessary near or across the midline of the chin.

Grafts and prostheses give cosmetic improvement, not functional. Primary grafting, whether metallic or bone, is to be avoided. Disarticulation is a radical surgical procedure which in most cases can be avoided; in addition such a procedure markedly reduces the effectiveness of a graft. There can be no union

at the joint site and surely no joint function is presumed. Temporomandibular arthroplasty may be tried later as a distinct and complicated procedure. Facial palsy as an added risk with this radical procedure is a sorry complication.

A delayed extra-oral grafting procedure with autogenous rib bone is preferred. Within the past two years we have tried several plastics for reconstruction, including the polyethylene plate and the porous plastic sponge material cut to size. Follow-up has shown very poor results as primary grafts; perhaps these materials should be given a trial as delayed grafts.

The following case reports are briefly presented to show the wide variations in clinical behavior. The diagnosis in each case has been carefully rechecked and the histology confirmed.

FIG. 1. Case 1. Large recurrent ameloblastoma which had been excised twice in the past year.

2

3

FIG. 2. Case 1. A massive regrowth of an ameloblastoma of the anterior mandible with a complicating pathologic fracture.

FIG. 3. Case 1. Large recurrent mass in the cut end of the right mandible three months after radical resection.

CASE REPORTS

CASE I. J. G., an eighty year old man, noted a protruding jaw for six months before he saw an oral surgeon who excised the lesion. There was a prompt recurrence and a wider excision was done six months later. When first seen as a referral, the patient had a massive regrowth complicated by a pathologic fracture. (Figs. 1 and 2.) A jaw resection was performed but within three months a large recurrence developed within the cut end of the right side. (Fig. 3.) This was resected and a lip reconstruction rather than a grafting procedure was done due to the patient's advanced age. The patient lived for one and a half years, when he died of heart disease. On examination made one week before death no evidence of local or distant tumor had been found.

CASE II. L. F., a forty-five year old man, had had a cyst removed from the lower jaw twenty-five years previously. In December, 1948, he noted a lump in the same region. X-ray showed the tumor to be 1 by 3 cm. long in the mandible extending from the bicuspid to the second molar area. The lesion was removed and the diagnosis of ameloblastoma confirmed.

CASE III. B. O., a seventeen year old boy, had noted a lump in his lower jaw for two years.

4 5

FIG. 4. Case v. Ameloblastoma of the mandible as seen in 1933.

FIG. 5. Case v. X-ray taken almost twenty years later after tumor was removed on five separate occasions.

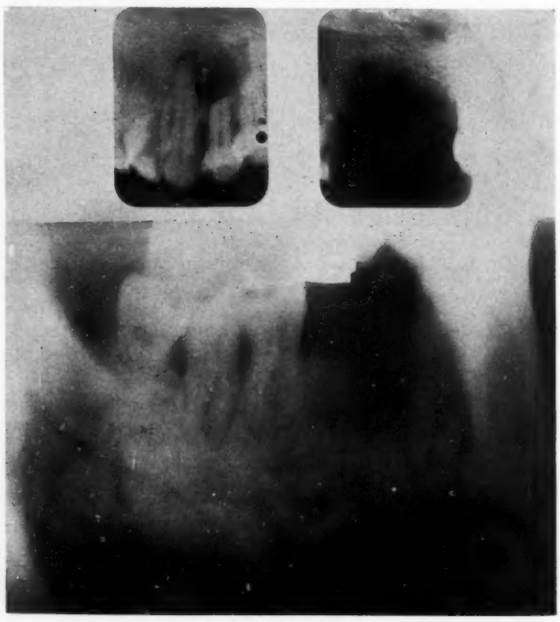


FIG. 6. Case VI.

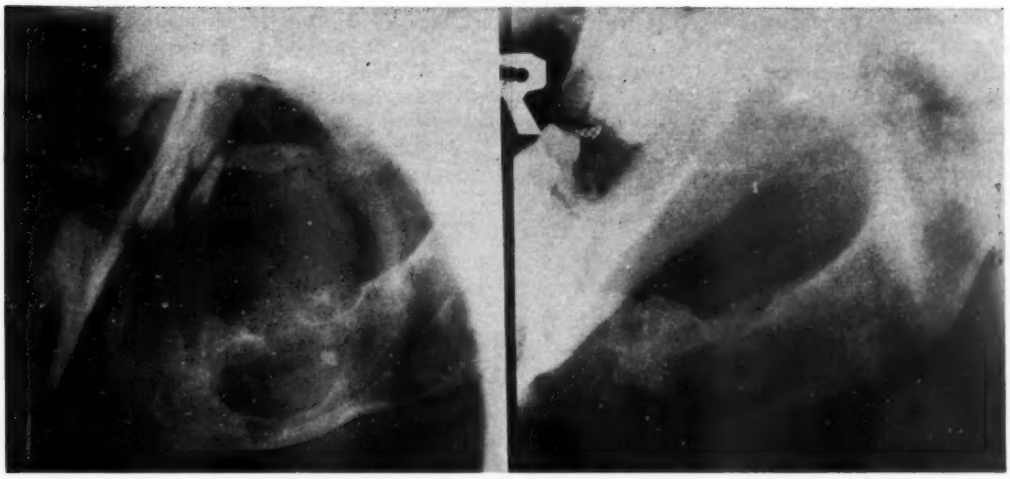
X-ray showed the tumor in the retromolar triangle. The ameloblastoma was removed locally and there has been no recurrence after 5 years.

CASE IV. R. M., a fifty-two year old man, had a mass in the lower jaw for six years. X-ray revealed the irregular lesion in the mandible extending from the cuspid to the first molar area. The mass was removed locally in March, 1946. Seven years later x-ray showed incomplete calcification but no definite evidence of recurrent disease.

CASE V. A. M., a thirty year old white woman, was first seen in 1933 with a radiolucent lesion in the mandible. (Fig. 4.) The lesion was removed locally and again at varying intervals until 1950, for a total of five times. (Fig. 5.) Each report was adamantinoma. Comparison of the photographs will show the x-ray changes from the onset to the present. This woman has had a normal functioning jaw during this interval of almost twenty years.

CASE VI. C. M., a forty-five year old Negro, complained of dull pain in the left mandible for three months. X-ray showed the tumor in the premolar region. The mass was removed locally in August, 1949. X-ray taken four and a half years later revealed calcification of the region with no definite evidence of recurrent disease. (Fig. 6.)

CASE VII. N. B., a fifty-six year old white man, had had swelling of the right mandible for six months. Figure 7A shows the tumor of the mandible which was removed thoroughly by an extra-oral approach in 1953. A recent x-ray taken approximately one year later shows



7A 7B

FIG. 7. A and B, ameloblastoma of the mandible and follow-up x-ray taken one year later after wide local excision.

the developing calcification without definite evidence of recurrence. (Fig. 7B.)

SUMMARY

The ameloblastoma is a benign tumor with a small percentage of doubtful histologic types that run a variable and unpredicted course.

This neoplasm is a unique tumor and a broad scope of investigation is necessary for complete evaluation.

Adequate excision of the early lesion should be done extra-orally with good exposure. It is hoped that complete extirpation will minimize the necessity for mandibular resection.

Acknowledgment: We would like to extend our appreciation to Dr. Charles G. Darlington and Dr. Gregory N. Brown of the Department of Pathology of the New York University College of Dentistry for the report and slides of Case V.

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STATISTICS seem to indicate that in some instances life can be prolonged after mastectomy for breast cancer if ovariectomy is performed. Sommers et al. think this is especially true if hyperplasia of the ovarian cortical stroma is present. They base their conclusions on autopsies of patients with breast cancer, of whom over 80 per cent had this hyperplasia. These authors believe that in such patients castration may be beneficial after the menopause as well as before it. (*Richard A. Leonardo, M.D.*)

A Method of Reduction of the Zygoma*

ALFRED J. SURACI, M.D., *Washington, D. C.*

ANATOMICALLY, the zygoma or malar bone is quadrangular in shape and situated at the upper and lateral portion of the face. It forms the prominence of the cheek, part of the lateral wall and floor of the orbit. It presents a convex malar surface which forms the prominence of the cheek referred to above and a concave temporal surface which is directed backward and medialward, articulating with the maxilla. Hence this bone plays an extremely important role in that it aids in forming not only the contour of the cheek but also the floor and lateral wall of the orbit by its junction with the orbital surface of the maxilla and great wing of the sphenoid.

From the standpoint of injury, displacement of this bone is usually the result of a direct force; and in the series of civilian cases reported in this article the highest percentage resulted from motor accidents, with physical assault the runner-up. The clinical findings are usually definite, the diagnosis in some cases being obvious immediately and exceedingly more important than x-ray findings, for on numerous occasions we frequently have returned an x-ray report of either "no displacement noted" or "only moderate displacement" in cases in which the zygoma has been greatly displaced into the antrum. In my opinion, therefore, clinical findings are of prime importance diagnostically.

When confronted with a severe case of this type of injury the usual clinical findings, when seen early, are: a flatness of the contour of the cheek on the side affected; the eyeball itself is not infrequently displaced posteroinferiorly on the side affected due to the impaction of the malar bone into the antrum with subsequent disruption of the orbital floor; and there is severe hemorrhagic conjunctivitis associated at times with so much edema of the orbital contents that it is alarming. When the patient is not seen soon after the injury, many times the flatness of the contour of the cheek on the affected side is difficult to detect due to the presence of considerable swelling; hence the ease with which so many of these cases are missed by the first individual who examines them. (These cases are then seen by the maxillofacial surgeon at a late date.) In view of its location and the fact that the malar bone itself is quite strong, most of the damage is confined to its fragile supports, namely: the arch; the infraorbital ridge in the region of the foramen, many times through it, thus causing localized numbness due to the damaged infraorbital nerve; the frontal process; and the anterior wall of the maxillary sinus. Impaction of the bone into the antrum often occurs, and injury to the surrounding structures, including the nose and eye, results. Fracture of the zygomatic arch frequently accompanies malar depression and there is pain in opening and closing the mouth due to the masseter muscle attachment. If the coronoid process or condyle of the mandible is impinged upon, there will be actual mechanical interference with the movements of the lower jaw. In the clinical evaluation of this type of injury the most important procedure is actual palpation and this is performed by placing the fingernail of each thumb on the infraorbital ridges with moderate pressure; invariably, regardless of the swelling present, the thumbnail may be seen to be displaced inferiorly on the traumatically displaced side. Since fracture of the infraorbital ridge usually takes place about its middle, the actual fracture site may frequently be palpated with ease and the lateral fragment of the ridge is noted to be displaced posteroinferiorly, many times causing interference with movements of the eyeball.

Suggested methods of treatment have been numerous, including attempts to grasp the fragment and reposition it with various types of forceps or towel clips (Manwaring); the use of the screweporte which is screwed into the fragment through an incision, the bone then

* Read at the Annual Meeting of the American Society of Maxillofacial Surgeons, April 25 to 28, 1954, Washington, D. C.

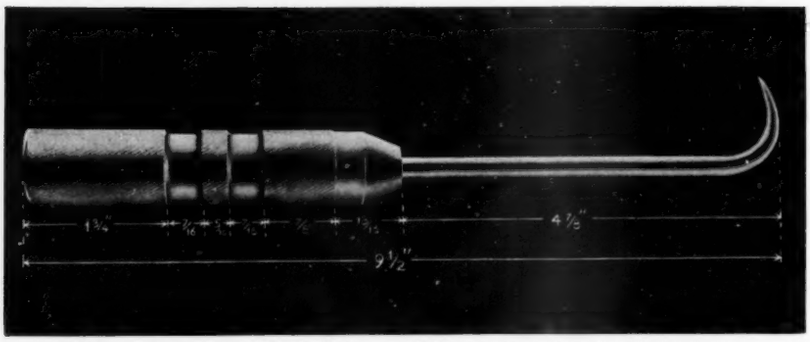

FIG. 1. Instrument* used for partially fixed or impacted zygoma.

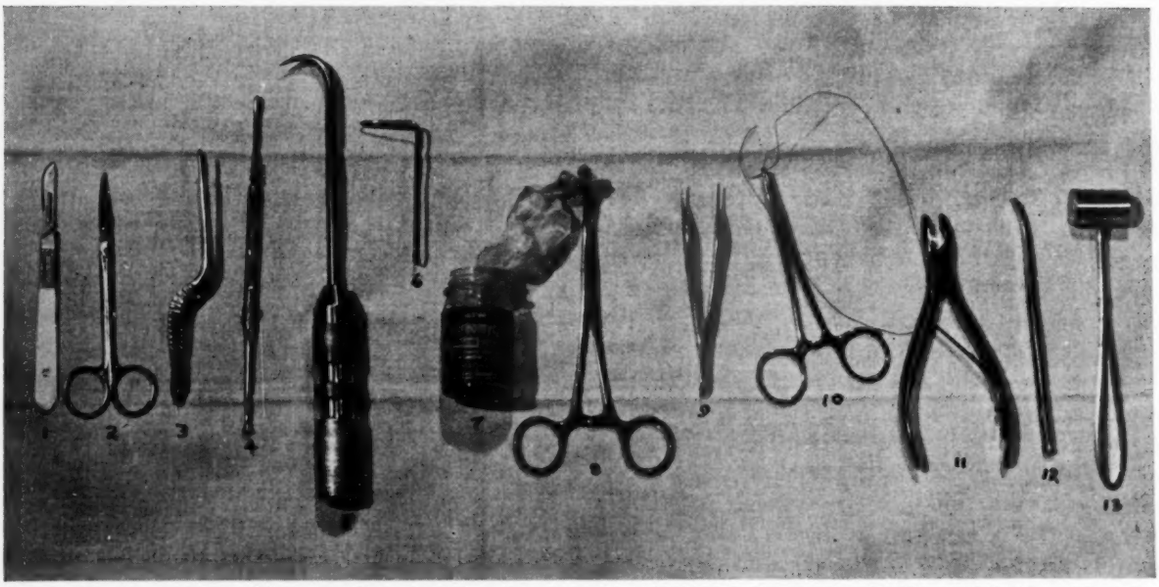

FIG. 2. Instruments used in operative procedure for elevation of impacted zygoma: (1) No. 10 blade and handle, (2) 5½ inch double-edge scissors, (3) bayonet forceps, (4) periosteal elevator, (5) special "hook," (6) Kirschner wire retractor, (7) aureomycin 2 inch packing, (8) curved Kelly forceps, (9) thumb forceps, (10) needle holder and suture. Occasionally it is necessary to use: (11) small rongeur, (12) chisel, (13) hammer.

manipulated into position immediately, or an attachment made to an arm projecting from a plaster head cap, thus reducing by elastic traction (Roberts). Still another method consists of making an incision above the hairline, through the temporal fascia, and passing a flat elevator over the temporal muscle and beneath the displaced bone, thus attempting to lever the bone in position (Gillies and Kilner). I believe this is an excellent method for reduction of a depressed fracture of the zygomatic arch itself but not for reduction of the malar bone, particularly if it is impacted.

There are many disadvantages to the methods of treatment mentioned heretofore, among which the most important are the length of time necessary for the surgical procedure, the actual discomfort to the patient, the presence of an avoidable scar causing a less pleasing cosmetic appearance, and the usual lengthier hospitalization.

In this series of cases the oral approach was used exclusively with an instrument devised solely for this purpose. (Fig. 1.)

The over-all length of the instrument, which resembles a hook, is 9½ inches. It has a serrated handle measuring 4½ inches and is so designed as to afford a firm grip with proper balance; a thin ¼ inch shaft then protrudes from the handle for a distance of 5 inches, terminating in a curved tapered point for ease of introduction beneath the displaced zygoma.

OPERATIVE TECHNIC

With the patient in a reclining position, chin elevated, usually under general anesthesia, and

* May be obtained from Kloman Instrument Company, Washington, D. C.

a gauze packing placed between the lingual surface of the teeth and tongue, a vertical incision approximately ½ inch in length is made through the mucosa of the maxilla in the region between the first and second molar teeth of the involved side. A small periosteal elevator (Instrument 4, Fig. 2) is then utilized to reflect the mucosa. In 90 per cent of the cases it falls into the antrum through the fracture site, whereupon the old blood begins to escape and is removed by the suction tip which should be available throughout the operative procedure, thus eliminating the hemorrhagic material within the antrum. Occasionally it is necessary to enter the antrum by use of a small chisel or by use of a very small curved rongeur (Instruments 11 and 12, Fig. 2), but this is unusual rather than usual.

The point of the instrument is then introduced into the antral opening in such a manner that it is directed superiorly and medially, the handle being toward the nose. (Position 1, Fig. 3.) It is then introduced deeper and rotated laterally beneath the malar bone in the same gentle motion (Position 2, Fig. 3); the rotation laterally and superiorly is then completed and the point of the instrument impinges beneath the malar bone. (Position 3, Fig. 3.) The impacted bone is then reduced by use of the alveolar process of the maxilla as a fulcrum and the instrument as a lever, or by a direct pull opposite to the force causing impaction. Other factors being equal, the earlier the operative procedure following injury, the easier the reduction. Now that the zygoma has been reduced, the instrument is allowed to remain in position until a 2-inch aureomycin packing is placed in the antrum beneath the bone to maintain immobilization in proper alignment. The instrument is then removed and the wound closed with several No. 0000 black silk sutures.

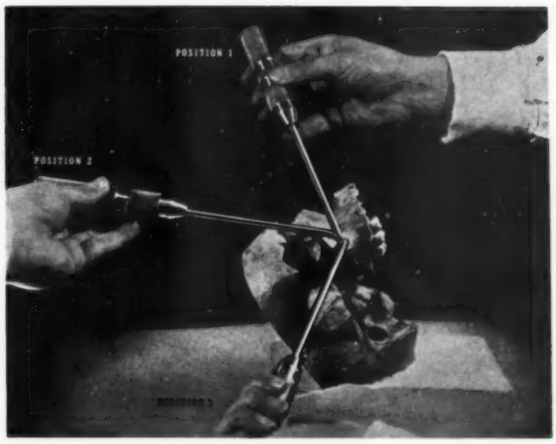

FIG. 3. Three major positions for proper introduction of instrument beneath zygoma.

POSTOPERATIVE CARE

Postoperatively the usual antibiotics are used as well as the following: frequent mouth washes of a mixture of one-half peroxide and one-half water or something tastier such as cepacol®; cold cloth compresses to the affected side which usually varies in swelling depending on the severity of the original trauma and the necessary surgical trauma; and frequent cleansing of the teeth with a soft toothbrush. The packing is then removed beginning the sixth postoperative day and is usually completed by the eighth postoperative day. If any mechanical resistance is noted when removing the packing, it is allowed to remain until the following day, by which time it will have loosened itself sufficiently to be removed with ease. It has never been necessary to give anesthesia, in this series, for removal of the packing. After removal of the packing the antral opening usually heals spontaneously.

COMMENTS

When operative proficiency has been developed, the method in itself is simple and efficient, the average operating time from incision to closure being between seven to twelve minutes. In the use of this method of reduction there are three factors of prime importance to which one must pay meticulous attention for maximum success. The first is the possibility of damaging the orbital contents by careless introduction of the point of the instrument beneath the malar bone denoted by Positions 2 and 3 in Figure 3. Although this has never happened in this series, it could happen. Second, after the malar bone is reduced, one must be careful not to immobilize it in too high a position, for if this occurs the bone will remain in this position permanently. Third, I believe the type of packing utilized for immobilization is exceedingly important: Prior to January, 1951, with the use of iodoform packing alone or impregnated with balsam of Peru 4 per cent of my cases had a resulting infection of the antrum of variable degree, whereas since using aureomycin packing I have

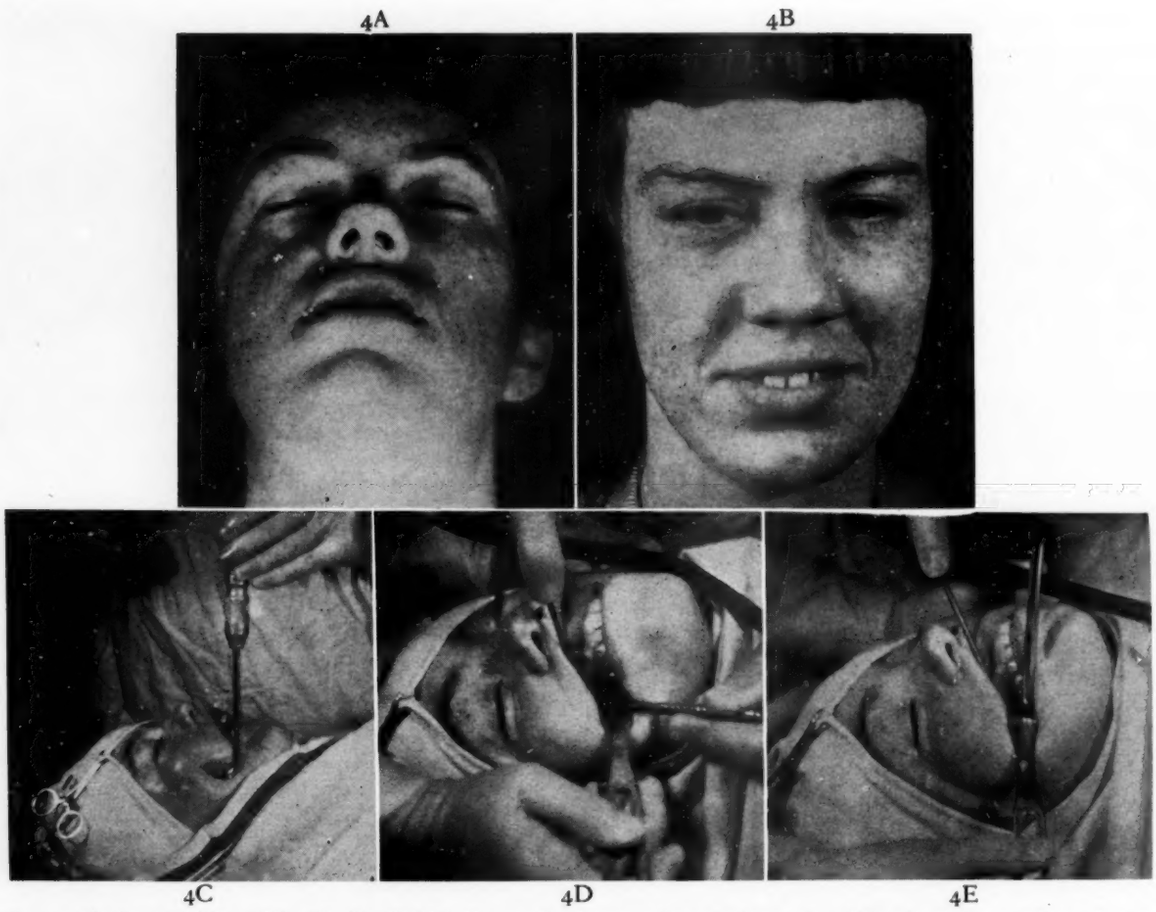

FIG. 4. Patient F. M., while playing field ball, was inadvertently struck on the right cheek by a fellow player, causing an immediate and marked impaction of the right malar bone into the antrum. A, early appearance of right cheek; note flatness of contour and lack of local tissue reaction. B, postoperative appearance three months later. C, repair within the hour; note beginning edema of the right cheek. D, periosteal elevator within the antrum, through the fracture site. E, instrument being rotated to Position 3 shown in Figure 3.

not had a single case of infection, secondary abscess formation of the lower lid or sensitivity to local use of the packing.

At this point I would like to complete my report with the material obtained from a total of 156 cases of reduction of the zygoma performed with the instrument previously described, over the past nine years, the majority of which were impacted and all of which were reduced by the oral approach.

In this series of 156 cases 55 per cent were males and 45 per cent were females. There was unilateral depression in 96 per cent and bilateral depression in 4 per cent. The left side was involved in 44 per cent and the right side in 56 per cent. Causes of injury were as follows: motor accidents, 47 per cent; altercations, 20 per cent; falls, 16 per cent; athletics, 7 per cent; miscellaneous, 10 per cent.

Included under miscellaneous are injuries produced by persons being struck by a metal pulley, kicked by a horse, struck across the face by lumber breaking off in a sawmill, pedestrians struck by a car and injuries sustained secondary to plane crashes. The earliest case was reduced within an hour; in two cases one was two months old and the other was three months old, but the latter two were successfully realigned. In 11 per cent of the cases the malar bone was badly comminuted but moulding was accomplished by placing the index finger in the antrum and repositioning the fragments, then supporting them by the aureomycin packing. (Figs. 4 to 6.)

SUMMARY AND CONCLUSIONS

1. An anatomic description of the zygoma is given emphasizing the point that most of the

5A 5B

6A 6B

FIG. 5. Patient M. H While driving her car this patient went through a fence and a wooden post pierced the windshield striking the sun visor. This in turn caused a direct blow to the left side of the face, resulting in a severely comminuted and impacted fracture of the left malar bone and infraorbital ridge into the antrum as shown in (A). The appearance four months postoperatively is shown in (B).

FIG. 6. Patient B. N. Marked comminuted and depressed fracture of the right malar bone associated with a depression of the zygomatic arch. A, note hemorrhagic conjunctivitis. B, postoperative appearance six months later.

damage is confined to its fragile supports rather than the bone itself.

2. Diagnostically, clinical findings and symptomatology far exceed aid given by x-ray although both should be used.

3. A new hook type instrument 9½ inches in length (Fig. 1) is described for use in the oral approach to realign the zygoma. The surgical technic for its use is described.

4. The surgical technic described for reduction of the zygoma and arch may be performed very simply and efficiently in a matter of minutes and is far superior to the older methods of reduction.

5. The postoperative course is less difficult and hospitalization is decreased.

6. The use of uncomfortable plaster head caps is eliminated with the use of this type of reduction.

7. Since January, 1951, the author has been using 2 inch aureomycin packing and has not had a secondary infection of the antrum or abscess formation of the lower eyelid, or local reaction to the gauze. This complication had previously occurred in 4 per cent of the cases.

8. If the malar bone is also comminuted when impacted into the antrum, the index finger may be utilized to mould the fragments,

after releasing the impaction with the instrument, and a packing carefully placed beneath the bone in the antrum to maintain alignment and immobilization.

9. Three points are worthy of consideration from the standpoint of possible complications. They are (1) avoid damage to the orbital contents by careful insertion of the instrument, not using force in any case, accurately aligning the point of the instrument beneath the zygoma (Position 3, Fig. 3); (2) avoid improper height of elevation; (3) use sterile 2 inch aureomycin packing for immobilization. Strict oral hygiene is advocated by use of frequent mouth washes and brushing of teeth postoperatively.

10. One hundred fifty-six cases are reported in which the oral approach was utilized in reduction with the special instrument described. The earliest injury which was successfully reduced occurred within an hour, and the oldest was three months. It was particularly noted that most injuries are caused by motor accidents and then by physical violence.

11. The use of this method for reduction of the malar bone is not advocated in old cases unless in conjunction with refracture. From the practical standpoint injuries up to six weeks old have been reduced without too much difficulty.

12. The primary use of this instrument and method is for freshly impacted or partially fixed cases.

Acknowledgment: Materials used in this work were supplied by Davis and Geck, Inc. (a unit of American Cyanamid Company), Danbury, Conn. The aureomycin packing used was a double-selvage packing gauze impregnated with a stable form of aureomycin hydrochloride. As a minimum it contained 4 mg. aureomycin hydrochloride per gram.

Metastasizing Sweat Gland Carcinoma of the Scalp Involving Transverse Sinus*

REPORT OF A CASE

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TRUE sweat gland carcinoma appears to be a rare tumor. In a recent study of 237 tumors of sweat glands in the files of Columbia University, Stout and Cooley[1] classed only six as malignant. These authors point out that many so-called sweat gland carcinomas were thus catalogued on insufficient evidence. Microscopic infiltration with some anaplasia, they believed, was not an indication of malignancy, since the tumors were of extremely slow growth and never metastasized. Also, the changes described in these tumors were no greater than those seen in some cystic sweat gland tumors confined entirely within the capsule of the cyst. Gates, Warren, and Warve,[2] in a review of world literature, found twenty-nine cases of so-called sweat gland carcinomas, of which only four showed metastases. Stout and Cooley's six cases in addition to seven from the literature, which they could accept as true carcinomas, make a total of thirteen proved, malignant, sweat gland carcinomas.

The site of origin of these tumors is of interest. Two were in the skin of the axilla, three in the arm side of the axilla, two in the vulva, one in the scrotum and one in the region of the male breast. These nine were all in areas in which apocrine sweat glands are found. Of the other four, two were in the scalp and one each in the wrist and eyelid. The case reported here records another infiltrating and metastasizing sweat gland carcinoma of the scalp.

CASE REPORT

Mrs. C., a sixty-two year old, obese, white female, first noticed a swelling in the scalp in the occipital region in 1946. The mass she described was the size of a navy bean, and the color of the surrounding skin. There was no pain or discomfort associated with it. The patient stated that there was no appreciable increase in the size of the mass until 1950. At this time, several separate nodules made their appearance, these eventually coalescing to form a single mass. Ulceration soon resulted, and it was bleeding from this mass that prompted the patient to seek medical treatment in 1952. She was referred by her physician to a general surgeon because of bleeding from the tumor of the scalp. The mass was described as being fixed to the skin, but movable over the pericranium. The tentative diagnosis was sebaceous cyst, but on opening the mass it became evident that this was a malignant tumor. The surgeon excised the mass and electrocoagulated the entire area, leaving the wound wide open. The tissue removed was reported by the pathologist as mucinous adenocarcinoma probably metastatic from either breast, colon or cervix.

A review of the patient's history brought to light the following: About one year prior to the onset of the present tumor, in 1945, the patient, at that time fifty-one years old, consulted a local doctor because of metrorrhagia of six months' standing. Her physician told her that she probably had a tumor and would need radium treatment. She was admitted to the hospital, and following curettage, radium was inserted into the cervix, for a period of forty-eight hours. Following this treatment there was no further bleeding, and there have been no further symptoms referable to the cervix.

Attempts to trace the pathologic report were unsuccessful so that the true nature of the lesion is not known. A careful general physical examination revealed no evidence of tumor in the breast or cervix. Because the tumor in the scalp had been present at least five years, the possibility of its being a metastatic focus was

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FIG. 1. Section of primary tumor. Mucinous adenocarcinoma involving the corium and subcutis with ulceration of the overlying epidermis.

considered very remote. The pathologist reviewed the sections and decided that this was a primary carcinoma arising in a sweat gland. (Fig. 1.)

The pathologic report revealed that sections of the tumor mass stained with hematoxylin and eosin showed a mucinous adenocarcinoma involving the corium and subcutis, with ulceration of the overlying epidermis. The tumor was well differentiated. The cells were often aligned in duct-like formation with a double layer of nuclei closely simulating the ducts of sweat glands. The gland-like structures were surrounded by mucin, and mucin-like material was often found in the lumen. A minimal amount of hyaline stroma was noted. Mitoses were frequent. The histologic appearance suggested primary mucinous adenocarcinoma arising from sweat glands rather than metastatic cancer.

On November 17th the patient was referred for repair of the defect. Examination at this time showed a round defect of the scalp measuring about 4 cm. in diameter presenting exuberant granulations. There was no lymphadenopathy. The wound was treated by saline soaks. On November 27th the wound was re-excised and the defect closed with thick-split graft. Careful examination of the tissue removed at surgery showed no evidence of tumor. The wound healed satisfactorily and the patient was discharged three days later. On December 1st a small node was felt about 2 cm. below the edge of the original tumor. This, however, disappeared, only to re-appear early in March. At this time it was noted that the node was non-tender and freely movable. After an unsuccessful needle biopsy the node was excised on April 13th and reported as being metastatic mucinous adenocarcinoma. Accordingly, on May 18th the patient was readmitted to the hospital, and a radical neck dissection was performed. Metastatic disease of sweat gland origin was found in four lymph nodes in the lower cervical chain.

Recovery was uneventful; the patient was seen at monthly intervals without evidence of recurrence until the early part of November, 1953. At this time the patient was insistent that some thickening had occurred at the anterior edge of the graft. This thickening made itself very evident in the next couple of weeks, and a needle biopsy showed tumor of the same structure as the original one. She was admitted to the hospital for further surgery. At this time the mass was circumscribed basing the incisions well beyond the tumor in the scalp and carrying the incisions down to the periosteum. It was then evident that the tumor had invaded the skull. A craniotomy was performed and the tumor found attached to the transverse sinus and dura over an area corresponding to the skull defect. It was thought then that in all probability the tumor was inoperable. Accordingly, the wound was closed and the patient returned to the ward. After further consideration a neurosurgical consultation was decided upon. An attempt to resect the mass was considered worth a trial. The patient was again taken to the hospital and at this operation the transverse sinus involved with the tumor, part of the tentorium and dura were successfully resected. Control of bleeding from the transected sinus was difficult but was accomplished by suture ligatures. The large defect left at the end of the procedure was closed by using gelfoam® for dura replacement, and swinging a large pedicle flap to cover the defect. (Fig. 2.) The donor site was skin-grafted.

The patient did very well following surgery, there were no neurologic changes, and the wound healed well except that one week after

FIG. 2. After resection and repair by rotation scalp flap.

the first dressing a leak of cerebrospinal fluid appeared. She was re-admitted to the hospital and the edge of the wound around the sinus was excised, and an advancement flap from behind the ear used to close the defect. Some drainage occurred up to the fourth day, but the wound healed satisfactorily after ten days. Five weeks later at a follow-up examination, a small mass at the posterior border of the trapezius muscle was discovered. Because of the obesity of the patient it was difficult to palpate the mass, but it seemed likely that it was a lymph node. Exploration through a large transverse incision showed a solitary node about 1 cm. in diameter. This, on later examination, proved to be a metastatic node. The wound has healed, and the patient remains well.

COMMENT

It is interesting to note that the tissues resected from the tumor bed prior to grafting showed no tumor. Although obvious bone involvement was not present, it is likely that the disease had already spread via the communicating vessels to involve the dura and the transverse sinus. Since the tumor was known to have existed for some five years, the possibility of bone involvement should have been suspected, and the initial resection probably should have included the periosteum and possibly the outer cortex of the bone.

SUMMARY

A case of sweat gland carcinoma of the scalp invading dura and transverse sinus, and metastasizing to the regional nodes is reported.

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Fractures of the Jaws*

A MODIFIED AND SIMPLIFIED METHOD OF TREATMENT

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THE principle of treating fractures of the mandible and maxilla is exactly the same as in the treatment of fractures of other bones in the body, namely, reduction and immobilization. However, due to their anatomic and topographic location the method of accomplishing these principles must of necessity vary from that of treating fractures of the long bones. It is not possible to apply a plaster of paris cast to a mandible or maxilla for immobilization because the bone cannot be encircled for absolute fixation. It is not feasible to apply traction via a pulley and weights because of the impracticability of attaching them to the mandible or maxilla. There are many different methods of treating fractures of the jaws and the procedure best adapted for a particular case must be chosen with great care and understanding. There are some cases which are best treated, *after* reduction, by fixation with cast splints. Edentulous patients may be cared for by use of the circumferential wiring method or internal fixation. Multiple fractures with loss of a number of teeth are sometimes best treated via the extraskeletal method of pin fixation or by internal fixation. Good functional results can be obtained only if normal dental occlusion is present after the fracture has healed.

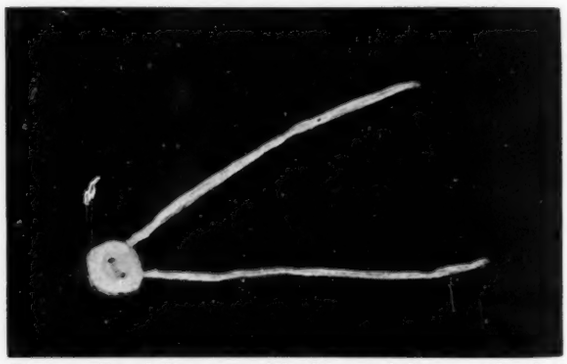

FIG. 1. Pearl button with fine stainless steel wire threaded through it.

Ligating the teeth adjacent to the line of fracture has been practiced since the time of Hippocrates. The principle of using the teeth for fixation purposes, and their occlusion as a guide to the reduction of the fragments, is still the basic principle in most methods of extraskeletal procedures of treatment. The first Gilmer method of interdental wiring, using individual teeth in the upper and lower jaws, was later improved by the same Gilmer when he advocated the use of alignment arch bars. These alignment arch bars, with various modifications, are fixed to all the remaining teeth in the jaws and are in effect the external counterpart of the internally injured bone. Traction and fixation are applied to the injured bone via the alignment arch bars. Robert H. Ivy introduced the loop or eyelet method instead of the alignment arch bar for treating fractures of the jaws. This has been a decided advantage because less equipment is required and less time is necessary for the operation. The author, however, prefers to use a finer wire than is needed for the Ivy loop method, and suggests the use of small pearl buttons which are very kind to the oral tissues. This procedure is also very simple and requires only a minimum of equipment plus the buttons which are easily obtainable at a notions counter. A .032 gauge stainless steel wire is threaded through both holes in the button. (Fig. 1.) The free ends are passed through the interdental space from the labial or buccal surface. Then each end of the wire is passed *around* the adjacent tooth until it emerges on the labial or buccal surface. (Fig. 2A and 2B.)

The free ends are again threaded through the holes in the button and drawn up tightly. The fine ligature wire can be pushed beneath

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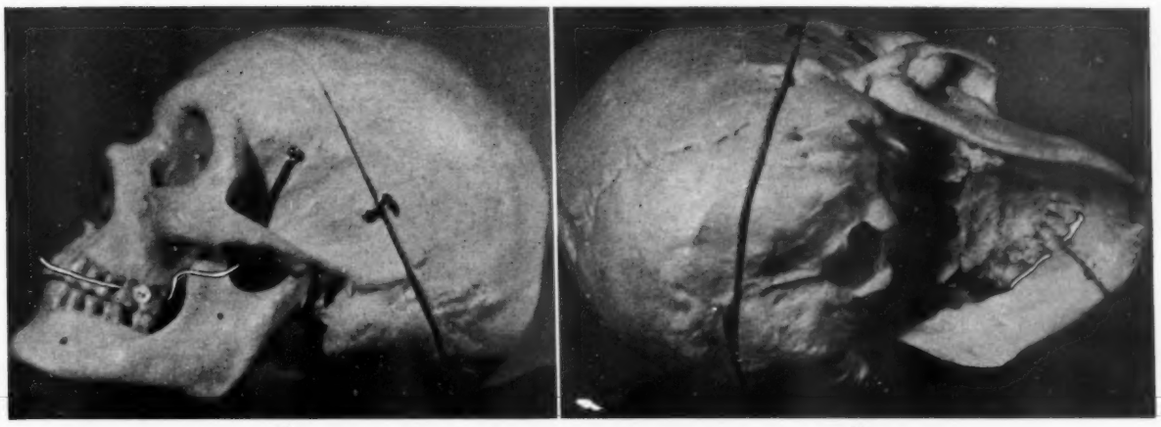

2A 2B

FIG. 2. A, pearl button with threaded wire encircling two teeth. B, lingual view.

FIG. 3. Pearl buttons used for applying elastic traction.

the gingiva where it is non-irritating and does not act as a repository for food. The free ends are twisted together and cut, the short end being turned over *on* the button and thus not coming in contact with the gingivae. As many such buttons as are needed can be quickly applied and are used for elastic traction or wire fixation. (Fig. 3.) It must be understood that this procedure cannot be used in *all* fractures of the mandible or maxilla; only in such cases in which there are sufficient teeth and where the injury is not of a crushing nature with multiple loose fragments in the fractured segment. It is advocated in the simple type of fracture in which there are sufficient teeth in the injured fragments and also in its opposite component. The author has used this method in selected cases with gratifying results.

Applications of Immobilization of the Mandible by Nasomandibular Wiring*

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FRACTURES of the mandibular condyle are common. Their management in children and edentulous adults is in ways similar, for under some circumstances sources of anchorage and fixation of the mandible other than the teeth should be sought. Circumferential wiring about the mandible and fixation in occlusion to the nasal spine has resulted in good postoperative occlusion with a wide range of painless motion in five children and six adults with condylar fractures. In the edentulous person sources of fixation other than the teeth must be used, and in the child one may prefer other sources in view of the instability of simple dental root attachments. Nasomandibular fixation is basically a modification of Thoma's method of immobilizing the mandible to the lateral nasal process.[1]

FIG. 1. Subcondylar fracture; nasomandibular wire in place.

A subcondylar fracture in this the weakest point of the mandible is common following a blow on the chin. The fracture may be unilateral or bilateral. (Fig. 1.) Nasomandibular fixation is easily accomplished (Fig. 1) and in almost all instances it may be done under local anesthesia. A single wire is not uncomfortable and mouth care is simplified. Good postoperative occlusion with a wide range of painless motion can be expected if immobilization in good occlusion is maintained for three to five weeks. As illustrated previously,[2] the nasal spine in the child and even the newborn is smaller than in the adult but is nonetheless accessible and usable in this procedure.

Immobilization of the mandible may be made easier in the partially edentulous patient by modifying nasomandibular fixation. The nasal spine serves well as a fixed point in the individual with sound lower teeth to which loop wires or an arch bar may be attached. On the other hand, the circumferential mandibular wire is equally usable in anchoring the lower jaw to wires or a bar applied on sound maxillary teeth. Nasomandibular fixation is also effective in the immobilization of the fractured body and ramus of the mandible.[2]

Nasomandibular wire immobilization of the mandible during a healing period is of value in situations other than fractures. Following a jaw resection the hemimandible and soft tissues may be retained in a normal position by one of several means. A space retainer such as a Kirschner wire may be placed between the bone ends at the time of resection, the teeth may be wired together or splints of various types may be used, etc. Fixation of the hemimandible by nasomandibular wiring is equally effective. It is particularly useful in the edentulous patient and in the patient whose soft tissues have been sacrificed. Splints being at times difficult to obtain, Kirschner wires eroding and necessitating removal and the ease of nasomandibular wiring may make this means of fixation prefer-

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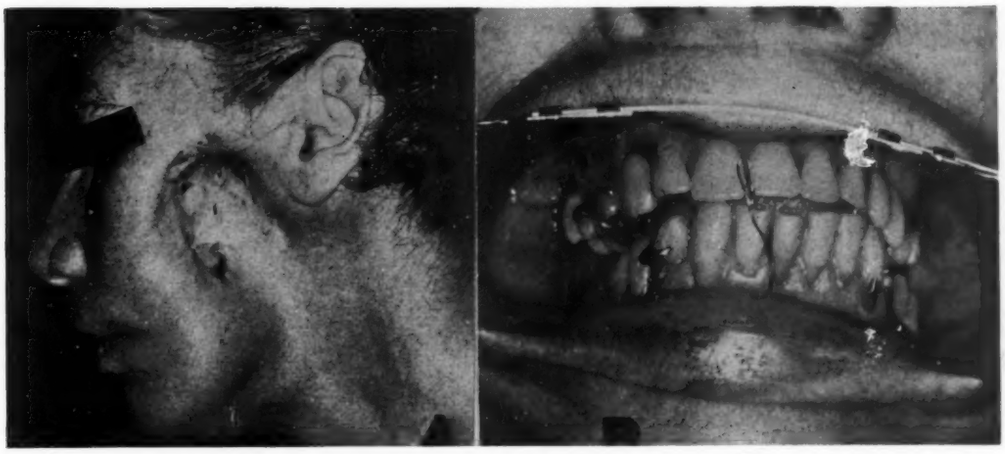
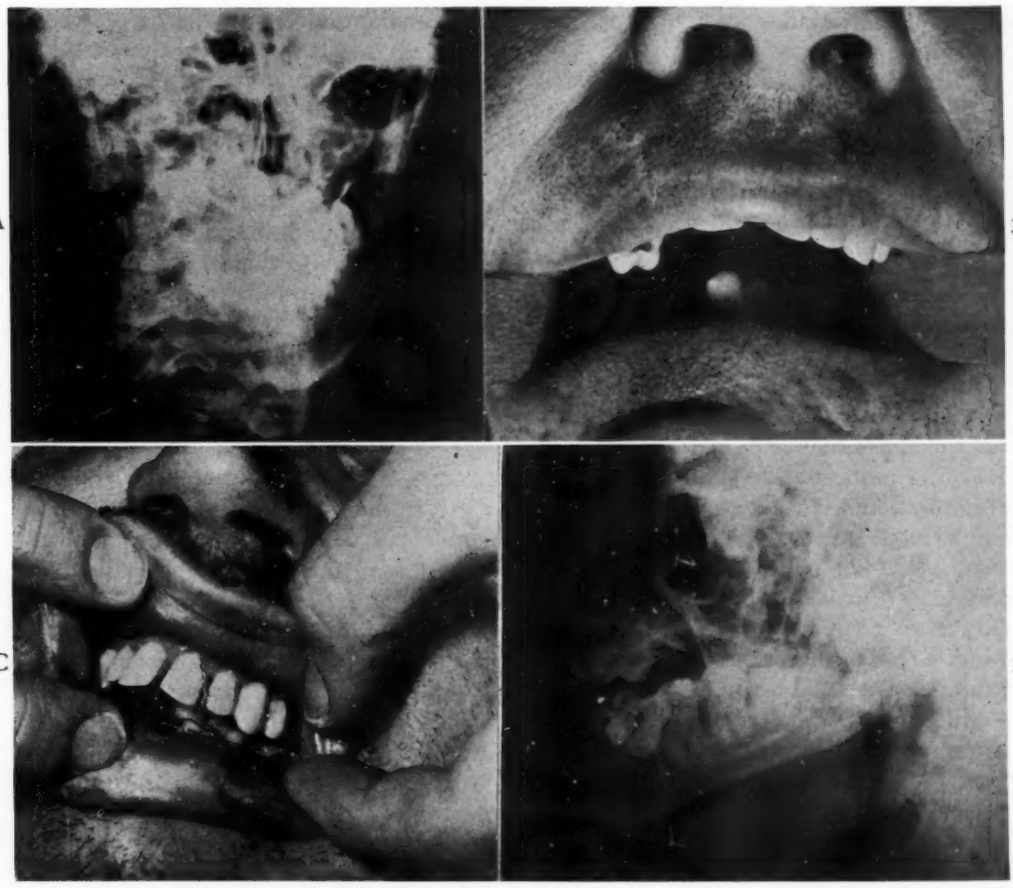


2A 2B

FIG. 2. A, operative defect following resection of the cheek, mandible and cervicle lymphatics. B, nasomandibular wire maintaining normal bone and soft tissue relationship.



3A 3B

3C 3D

FIG. 3. A, disarticulation of the right mandible and resection past the midline. B, remaining left mandible with marked deviation and loss of stability. C, reconstruction of right mandible with rib bone graft; bone wedging and wire fixation to left mandible. C and D, nasomandibular wire immobilization of hemimandible and bone graft.

4A 4B

FIG. 4. A, rib bone graft reconstruction of the right hemimandible. Note bone wedge and wire fixation of the graft, and nasomandibular wire immobilization. B, nasomandibular wire fixation following a bone graft to the right ramus and mandibular angle.

able even in the patient who is not edentulous. Retaining the hemimandible and therefore soft tissue in normal position is essential.

Immobilization of the hemimandible is important when bone-grafting a mandibular defect. The bone graft is anchored to the mandibular fragment or fragments by accepted methods. The entire unit, graft and hemimandible may then be immobilized simply by nasomandibular wiring. The brief mention of two cases indicates this application.

CASE I. A forty-two year old white woman was seen relative to a malignant tumor in the left alveolus and adjacent buccal mucosa. Partial resection and x-ray therapy had failed to control the mass and a palpable node had occurred at the angle of the mandible in the cervical lymphatic chain. The malignancy was a mucoepidermoid tumor of ectopic salivary gland origin. Radical resection of the cheek, mandible and cervical lymphatics *en bloc* was performed. (Fig. 2A.) The normal position of the remaining mandible was maintained by nasomandibular wiring for three weeks. (Fig. 2B.) Thereafter good occlusion and free motion persisted without bothersome deviation. Space retainers such as a Kirschner wire often erode the overlying soft tissue and have to be removed prematurely or, as in this instance, cannot be used due to an absence of soft tissue. Wiring of the remaining teeth was not ideal, for occlusion for the most part was with dentures.

CASE II. A thirty-eight year old white man had had his right mandible disarticulated and resected past the midline for an isolated disease of the mandible. (Fig. 3A.) Five years later he was seen with deviation of the remaining mandibular fragment toward the midline and without stability. (Fig. 3B.) A rib bone graft was used in the reconstruction of the right mandible. Union of the graft to the end of the mandible was by bone wedge and wire fixation. (Fig. 3C.) Immobilization of the hemimandible and graft by interdental wiring was not suitable with only one tooth approaching occlusion. Immobilization was accomplished and maintained for six weeks with a nasomandibular wire. (Figs. 3C and D, and 4A and B.) Healing and bony union occurred without incident.

CONCLUSIONS

1. Immobilization of the mandible by a single wire nasomandibular fixation is discussed.

2. Cases representing the following problems are illustrated: (1) fractures of the condyle of the mandible; (2) immobilization of the remaining hemimandible following jaw resection for maintenance of normal space and proper position of tissues; (3) immobilization of the hemimandible and bone graft following reconstruction of the resected mandible with a bone graft.

3. Nasomandibular wire fixation is easily performed and is highly effective. It is particularly applicable to children and edentulous adults.

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Black et al. studied the microscopic structure of gastric carcinomas and found that postoperative prognosis depended more on whether there was a "lymphocytic reaction in the stroma of the primary tumor and/or sinus histiocytosis of the regional lymph nodes" than on the presence or absence of lymph node metastases or delay in performing surgery, etc. When there was this lymphocytic reaction and/or sinus histiocytosis, the patients lived a greater number of years postoperatively. (*Richard A. Leonardo, M.D.*)

Bone Grafting in Malformations of the Jaws*

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MALFORMATIONS of the jaws may be of prenatal origin, due to lack of coalescence of facial processes, or they may occur in postnatal life as a result of trauma or disease which affects the growth of the jaws and results in underdevelopment or distortion.

Bone grafting is frequently necessary in these malformations in order to restore contour. Such conditions often require coordinated methods of treatment which may be orthodontic, prosthetic or surgical. In malocclusion of the jaws orthodontic treatment and surgery are both usually required in order to restore dental occlusal relationships.

Retrusion of the maxilla may be the result of developmental malformation. A dish-face deformity is often associated with marked retrusion of the nasomaxillary area. It should be recalled that in the case of the atresic maxilla, orthodontic treatment is frequently employed in order to restore the dental occlusion. Orthodontic therapy, however, influences only the dento-alveolar segment of the jaw and plays little or no role in affecting the body of the bone; in such cases, additional contour-restoring bone grafting is of value.

Mandibular malformations often result in distortion of the facial contour. Such deformities include underdevelopment of the mandibular symphysis, atresia of the body of the jaw or asymmetric development of the mandible. In rare cases a segment of the jaw is absent, as in congenital absence of the ramus[1]; a very rare anomaly is the absence of the entire mandible. In other cases hypertrophy of bone occurs. Restoration of adequate contour and function may thus require bone grafting to restore contour, to re-establish the continuity of bone or even to remove excess bone from a hypertrophied area of the mandible, and in some cases to shift such bone to an area requiring additional contour.

Malformations of the jaws are frequently accompanied by malocclusion of the teeth; the first surgical procedure aims at improving dental occlusal relationships by osteotomy. Re-establishment of improved occlusal relationships may not entirely remedy the deformity; developmental distortion of the malformed bone often remains even after occlusal relationships have been corrected.

Careful study and accurate diagnosis is necessary in all cases of malocclusion of the jaws. A proper diagnosis can be made only after clinical examination, a study of photographs and a careful examination of the occlusion from study of casts and roentgenograms. Recent studies have proved the value of cephalographic diagnosis.[2] The complete diagnosis, thus established, is helpful in indicating treatment which may include either orthodontics, prosthetics, surgery or a combination of these methods.

Bone grafting has become an accepted method of treatment of mandibular defects since World War I. A number of materials, heterologous or homologous in nature, have been employed for contour restoration of the face, but fresh autogenous bone has been found to be superior to other materials used for contour restoration because bone grafts become an integral part of the skeletal framework of the face. The bone is usually obtained from the ilium; the technic of removing iliac bone grafts has been described.[3]

Contour-restoring bone grafts may be introduced through external incisions or through intra-orally placed incisions. The technic of intra-oral bone grafting has also been described.[3–5]

Of a series of jaw malformations requiring contour restoration by bone grafts, the following three examples have been selected for description.

CASE I. M. K., an eighteen year old girl, is an example of a maxillary retrusion with malocclusion which was corrected by bone grafts and orthodontic procedures. (Fig. 1.)

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FIG. 1. Contour restoration of the maxilla by bone grafting. A, example of multiple deformities of the face with retrusion of the maxilla due to underdevelopment. B, restoration of contour obtained by bone grafts applied over the maxilla through the intra-oral approach. In addition to orthodontic treatment a nasal plastic operation and an operation for the correction of lop ears were performed.

This patient presented multiple facial malformations. (Fig. 1A.) There was a noticeable underdevelopment of the body of the maxilla, resulting in retrusion in the nasomaxillary and infra-orbital areas. There was marked protrusion of the anterior maxillary teeth and also a chin deficiency. Lop ears were an additional defect. Orthodontic treatment was decided upon as the initial treatment, to be followed by contour restoration of the retruded maxillary area by means of bone grafts. The protrusion of the maxillary teeth was corrected by the removal of a bicuspid on either side of the alveolar arch and correction of the dental arch by orthodontic procedures and a retention bite plate. Contour-restoring bone grafts were then applied to the maxillary area through the intra-oral approach.

On December 12, 1952, with the patient under general endotracheal anesthesia, an incision was made in the oral mucosa of the lip, lateral to the frenulum on each side, and made above the vestibular cul-de-sac on the inner surface of the lip. After dissecting the mucosa from the orbicularis oris muscle, the periosteum was incised and elevated, exposing the defective areas of the maxilla; wide exposure was thus obtained. The infra-orbital nerve and vessels were avoided by carefully raising the periosteum around the neurovascular bundle and preserving its attachment to the elevated soft tissues. Good exposure was obtained from the border of the pyriform aperture to the zygoma laterally by subperiosteal raising of the soft tissues with retractors. The area of exposure extended to the level of the infra-orbital margin.

Previous to the bilateral intra-oral exposure of the maxilla, bone grafts were removed from the right iliac bone. After exposing the crest of the ilium and incising through the periosteum, subperiosteal exposure of the inner table of the ilium was obtained by retraction medialward of the iliacus muscle. Bone grafts, which consisted of the inner table of the ilium with its attached cancellous bone, were removed. The bone grafts were suitably shaped and placed in the retruded maxillary area on each side of the pyriform aperture; the grafts consisted of a main segment of bone around which were packed numerous chips of cancellous bone.

After placing the bone grafts, the intra-oral incisions were sutured with interrupted sutures of No. 0000 plain catgut. External pressure dressings were used to immobilize the graft. The eyelids were sutured to avoid corneal abrasion under the pressure dressings. The pressure dressings were maintained for a period of six days, following which further dressings were dispensed with.

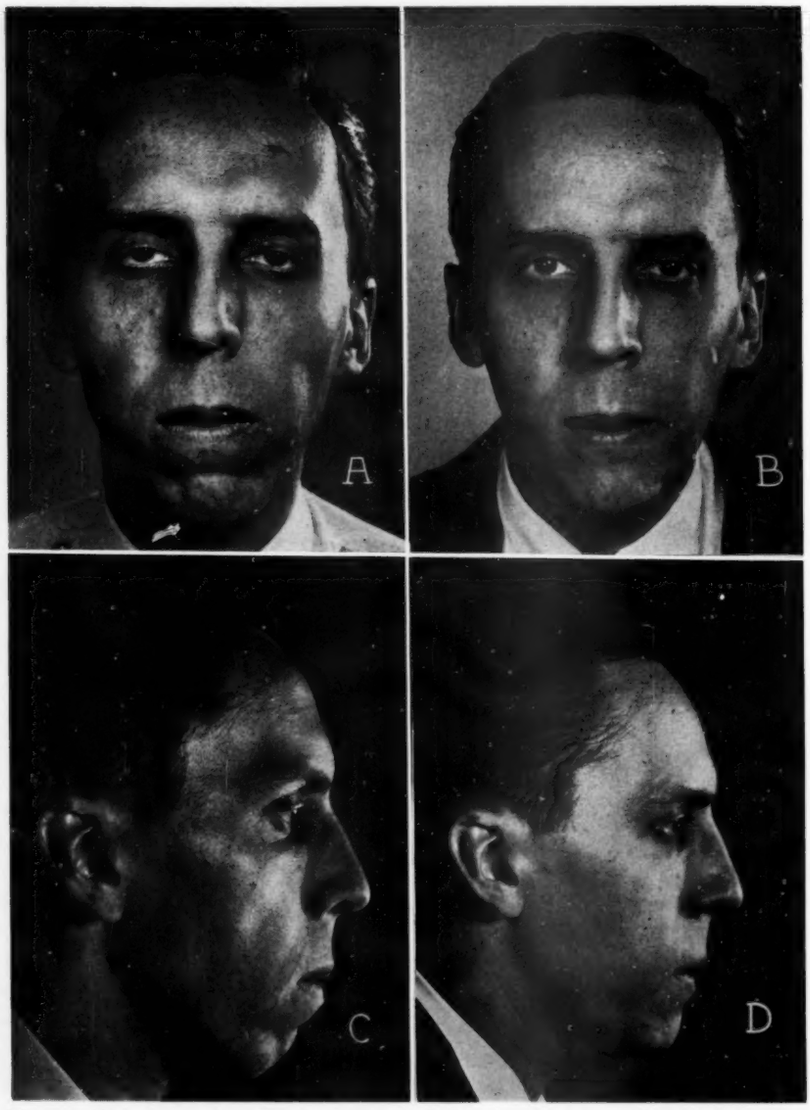

FIG. 2. Contour restoration by bone graft in a case of mandibular deformity with microgenia. A, full-face appearance of patient showing underdevelopment of the chin. B, postoperative full-face appearance obtained by a bone graft introduced through the intra-oral approach. C, Preoperative profile view of patient. D, postoperative profile view of patient after bone grafting.

Subsequent to this operation a nasal plastic operation and a plastic procedure for the correction of the lop ears was performed, thus completing the treatment. (Fig. 1B.) Cephalographic studies two years after bone grafting showed the presence of the grafts and the maintenance of the corrected contour.

CASE II. J. Y., a thirty-one year old Air Force officer with an underdeveloped mandibular symphysis, is an example of contour restoration by bone grafting. (Fig. 2.) This patient showed the typical deformity found in microgenia, which includes backward slope of the chin, downward retrusion of the lower lip and a degree of difficulty in occluding the lips. (Fig. 2A and C.) The fat pad of the chin was displaced upward, obliterating the labiomental fold; and when the patient closed the lips, marked puckering in the chin area occurred due to the contraction of the mentalis muscles. Clinical and cephalographic studies revealed an unusual maldevelopment of the mandible with an extremely wide gonial angle. Various methods of treatment were considered, among them the possibility of osteotomy at the mandibular angle. Bone grafting, however,

seemed a simpler method for improving the contour. The cephalogram shows not only the bony contour but also permits accurate measuring of the overlying soft tissues. By comparing a tracing of the preoperative profile contour of the bones with a tracing of the proposed postoperative contour it is possible to obtain an accurate measurement of the thickness of the bone required to achieve the desired contour. Bone grafts should not be placed at the tip of the symphysis, but slightly above the lower border of the symphysis in order to avoid further lengthening of the lower third of the face.

On September 28, 1953, with the patient under infiltration local anesthesia, using hyaluronidase and novocain,® the right iliac bone was exposed, the periosteum was incised and the medial aspect of the ilium was approached. The bone grafts consisted of the inner aspect of the crest and included some of the inner table of the ilium with attached cancellous bone.

Under local block anesthesia and infiltration an incision approximately 5 cm. in length was made in the oral mucosa above the attachment of the frenulum on the inner aspect of the lower lip. The intra-oral approach has the advantage of providing a wide exposure of the area to be grafted. The importance of placing the incision sufficiently high above the cul-de-sac of the sulcus to permit easy closure by suture must be stressed. The larger the bone graft, the higher up the incision should be placed. After the bone graft has been introduced beneath the periosteum, the bulk of the graft causes an advancement of the lower lip and the musculature which makes up its content. This places tension upon the mucosa of the lower lip and may result in a gaping of the mucosa; the incision is placed high in order to avoid separation of the mucosa.

The mucosal flap was separated from the orbicularis oris muscle and upon reaching the periosteum the latter was incised, then raised with a sharp periosteal elevator, thus exposing the mandible. Subperiosteal elevation of the region of the symphysis was extended to the lower border of the bone and extended laterally to the mental foramen on each side.

The bone grafts removed from the ilium were cut to adequate size and two bone grafts, suitably shaped and fitted in the midline by means of a miter joint, were then introduced over the symphysis. Chips of cancellous bone were employed to fill the interstices between the bone grafts and were packed underneath and between the grafts and the mandible to obtain adequate projection of the chin.

Strips of elastoplast on the skin over the graft maintained the immobilization of the grafts. The first strip was placed in the labiomental fold in order to maintain the correct position of the graft over the symphysis. Successive strips of elastoplast were then placed over the chin. These were then anchored by strips of plain adhesive to maintain firm immobilization for a period of seven days.

Careful palpation of the bone-grafted chin revealed that firm fixation of the grafts had occurred at the end of the first postoperative week. Uneventful healing of the intra-oral incision and firm consolidation of the bone grafts occurred during the subsequent two weeks. Follow-up cephalographic studies in this patient have revealed the consolidation of the bone grafts to the mandible and the maintenance of the original shape of the implants. (Fig. 2B and D.) This case shows not only the result obtained by adequate restoration of contour of the chin but also improvement in the function of the lower lip as the result of correct replacement of the soft tissues of the lower lip and the muscles which activate the lip.

Case III. H. H., a thirty-three year old female patient, is an example of bone grafting in mandibular atresia. (Fig. 3.) The etiology of the deformity was traced to an infection of the jaw with osteomyelitis in early childhood. The growth of the mandible was arrested, resulting in marked deformity and the typical birdlike profile associated with mandibular atresia. (Fig. 3A and C.) In this case bone grafting was used not only to restore the facial profile but also to achieve elongation of the mandible in order to establish a firm base for a prosthesis.

On May 12, 1952, with the patient under general endotracheal anesthesia, bone was removed from the right iliac bone. The grafts included the inner aspect of the crest and table of the ilium, both cortex and attached cancellous bone.

An incision about 6 inches in length was made in a flexion crease of the neck situated below the mandibular symphysis; the atresic mandible was exposed. The bone near the base

FIG. 3. Contour restoration by bone grafting in mandibular atresia. A, full-face appearance of patient with mandibular atresia. B, restoration of contour obtained by bone grafting in order to obtain a firm base for an epithelial inlay, the restoration of a labiobuccal sulcus and the retention of a denture. C, preoperative profile view of the patient illustrating the bird-like profile. D, postoperative profile view of the patient.

of the tongue was found to be extremely small, approximately 1.5 cm. in thickness. It was exposed by subperiosteal elevation and a graft approximately 6 by 4 cm. was shaped and placed over the mandible, to which it was maintained by a stainless steel wire suture. The bone graft was extended downward in order to restore adequate facial length. Difficulty was encountered in suturing the soft tissues over the bone graft because of tension. Excess bone was stored in the bone bank for future use.

Consolidation of the first bone graft occurred uneventfully and plans were made for additional bone in a second operation, tension on the soft tissues over the bone graft having prevented the addition of bone at the first operation. On November 19, 1953, the previously stored autogenous bone was used to further build up the bone-grafted area. A second bone graft was placed over the first graft after adequate exposure.

On March 18, 1954, an intra-oral incision

was made in front of the bone-grafted area between the bone grafts and the soft tissues of the lip and chin, and a dental compound impression was procured of this newly created sulcus. An acrylic bite block had been prepared previously to be used as a base for a dental compound impression of the surgically prepared buccal sulcus. A thin split-thickness graft, cut with the dermatome from the inner aspect of the arm, was placed over the dental compound mold and placed into the sulcus. Satisfactory healing of this epithelial inlay occurred; a prosthesis further improved the patient's facial contour. (Fig. 3B and D.)

SUMMARY

1. Malformations of the jaws are discussed.

2. The superiority of the bone graft over other contour-restoring materials is stressed.

3. Methods of establishing the diagnosis are discussed.

4. Three examples of jaw malformations requiring contour bone grafting are described.

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Cephalographic Diagnosis in the Surgical Treatment of Malformations of the Face*

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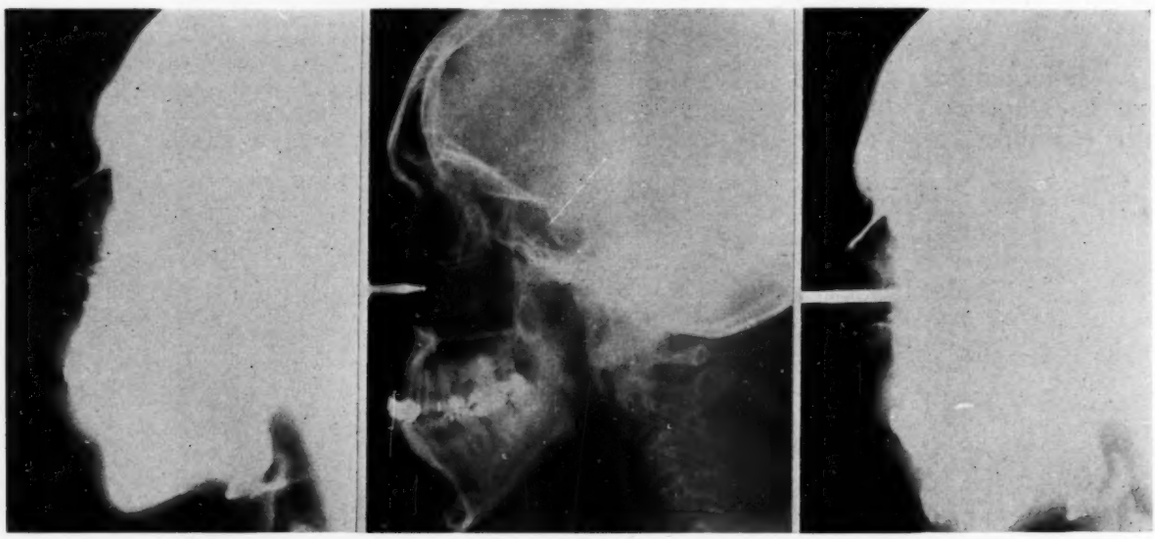
THE purpose of this report is to present a preoperative cephalographic method of diagnosis for malformations of the face which require surgical treatment, and also to stress the practical value of this method of diagnosis in planning the surgical correction of such conditions.

The development of cephalometric technics owes its origin and stimulus to special apparatus designed by pioneers in the field of cephalometry.[1–5] A valuable instrument has thus become a research tool in studies pertaining to the growth of the head and the face and is also employed in clinical studies.[6–13]

Cephalometry enables the measurement of the head in living individuals, thus making possible the recording of cranial and facial dimensions between anatomic and anthropometric landmarks which are otherwise not visible or accessible in the living.

Long-established metric determinations employed by anthropologists, von Ihring,[14] Hrdlicka[15] and Hellman[16] among others, have been adapted to cephalographic studies. The intersections of various planes and lines, drawn upon tracings of cephalograms, form angles which are measured and compared with accepted standards.



1A 1B 1C

FIG. 1. Sagittal plane cephalograms of an underdeveloped symphysis. A, preoperative view showing contour and thickness of soft tissue. B, preoperative view showing bony structure. C, postoperative view showing consolidated bone graft to the chin and improvement of the facial profile.

The skeletal landmarks selected for use in this study are (1) the center of sella turcica, (2) nasion and (3) mentum. All of these points of reference are readily located in the sagittal plane cephalogram of the adult.

It will be recalled that nasion is the most anterior point in the mid-sagittal plane of the skull, at the junction of the frontal and the nasal bones. Mentum, in this study, is understood to be the most anterosuperior point on the outer surface of the bony chin; this point is also known as pogonion.

* Read at the Annual Meeting of the American Association of Maxillofacial Surgeons, April 25 to 28, 1954, Washington, D. C.

A line drawn on the tracing of the sagittal plane cephalogram between nasion and the center of sella turcica is the cranial base line in this study; a line drawn between nasion and mentum is the facial plane.

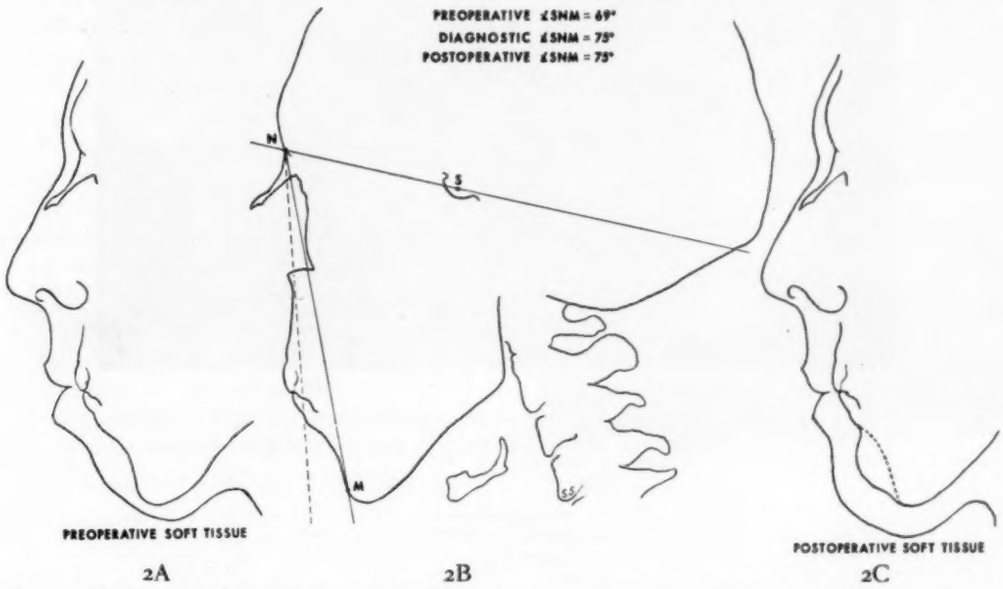
Previous cephalographic investigations by Margolis[4] have shown that the angle formed by the intersection of the cranial base line and the facial plane averages approximately 75 degrees in the well balanced face. The angle of 75 degrees is employed in this study as a standard of comparison for angles at nasion.

A few years ago we became interested in applying cephalometric technics to problems associated with reconstructive plastic surgery of the face and jaws. Since that time we have studied a number of facial malformations with a view to developing a method of cephalographic determinations to aid in attaining symmetric results in the correction of such deformities.

Five varieties of facial malformations have been selected for this presentation: (1) underdevelopment of the mandibular symphysis; (2) elongated and retruded mandible; (3) mandibular prognathism; (4) asymmetry of the lower portion of the face; (5) loss of a portion of the mandible accompanied by a lessened vertical dimension of the face.

CASE I. Figure 1 consists of three sagittal plane cephalograms of an adult male with an underdeveloped mandibular symphysis, resulting in a retruded appearance of the lower portion of the face. Surgical correction consisted of a bone graft from the crest of the ilium to the chin.

Figure 1A shows the thickness and contour of the soft tissue; the bony structure is seen in Figure 1B; both A and B are preoperative cephalograms. The postoperative view is shown in Figure 1C.



2A 2B 2C

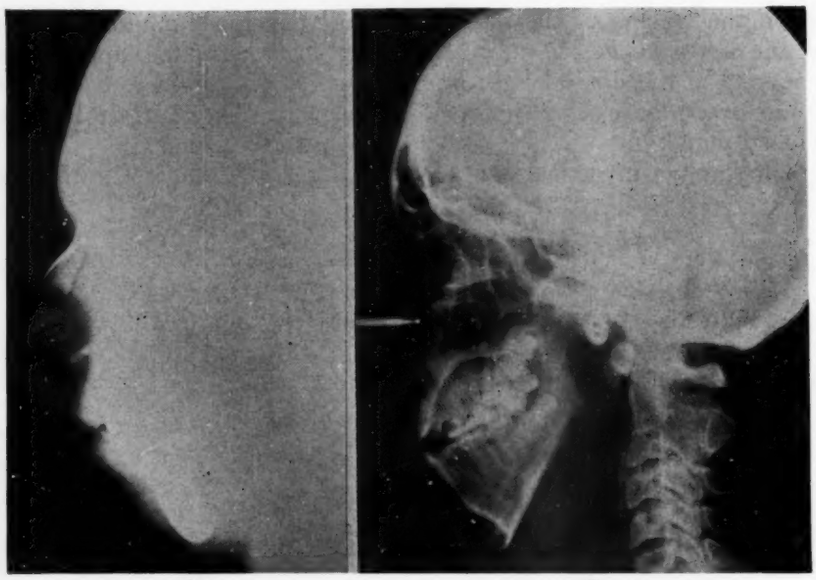
FIG. 2. Tracings of the cephalograms in Figure 1. A, preoperative soft tissue profile. B, cephalographic diagnostic planes and angles drawn on a tracing of the cephalogram in Figure 1B. C, postoperative soft tissue profile; the bone graft is indicated.

Figure 2 consists of tracings made from the cephalograms shown in Figure 1.

Technic of Cephalographic Diagnosis in Case I. The cranial base line and the preoperative and diagnostic facial plane are drawn on the tracing of the sagittal plane cephalogram seen in Figure 1.

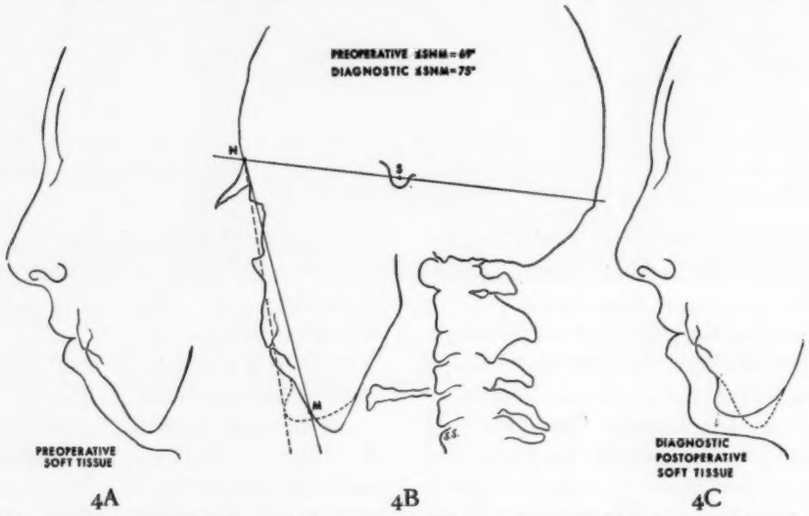
The preoperative angle at the intersection of the cranial base line and the facial plane measures 69 degrees. The angle at nasion is increased to 75 degrees and a new facial plane is established anterior to mentum. The distance between mentum and the diagnostic plane is measured and a bone graft corresponding in size with this measurement is transferred to the chin, as shown in Figure 1C.

CASE II. Figure 3 consists of preoperative sagittal plane cephalograms of an elongated and retruded mandible. In this figure, A shows the contour and thickness of the soft tissues; B is a view of the facial skeleton.



3A 3B

FIG. 3. Sagittal plane cephalograms of an elongated and retruded mandible. A, contour and thickness of the soft tissues. B, view of the bony structure.



4A 4B 4C

FIG. 4. Tracings of the cephalograms in Figure 3. A, profile view of the soft tissues. B, cephalographic diagnostic planes and angles drawn on a tracing of the cephalogram in Figure 3B. C, diagnostic postoperative soft tissue profile to be anticipated. The bone graft removed from the lower border of the mandible and shifted to the anterior portion of the body of the mandible is indicated.

Figure 4 consists of tracings made from the cephalograms shown in Figure 3. Figure 4A is a tracing of the soft tissue profile view; B is a tracing of the bony profile.

Technic of Cephalographic Diagnosis in Case II. The angle formed by the intersection at nasion of the cranial base line and the preoperative facial plane in this case is 69 degrees. This angle is increased to the average angle for well balanced faces, 75 degrees, and a diagnostic facial plane is established anterior to mentum. The distance between mentum and the diagnostic plane is then measured and a bone graft of similar size is prepared.

Because the extra length of the body of the mandible in this case lends itself to such a procedure, the required bone can be removed surgically from the lower portion of the body of the jaw and then shifted anteriorly, as indicated in this figure, to serve as the bone

graft to the chin. Figure 4C illustrates the results which may be anticipated.

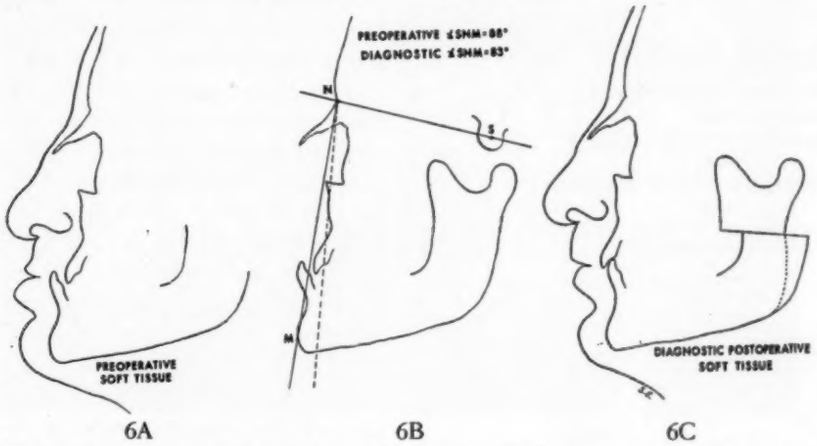
CASE III. Figure 5 is a sagittal plane cephalogram of mandibular prognathism, showing both the underlying bony structure and the overlying soft tissue.

Figure 6 consists of tracings made from the cephalogram shown in Figure 5. The tracing of the soft tissue profile is shown in Figure 6A; a tracing of the skeletal profile is seen in B.

Technic of Cephalographic Diagnosis in Case III. The angle formed by the intersection of the cranial base line and the preoperative facial plane is 88 degrees, as shown in Figure 6B. The angle at nasion is reduced to 83 degrees in this case for the reasons which follow, and a diagnostic facial plane is drawn on the tracing, posterior to mentum. The measurable distance between the two facial planes is then equivalent to the extent of retrusion desired.

The cephalogram (Fig. 5) indicates the proximity of the posterior border of the ramus to the oropharyngeal tissues. If sectioning of

FIG. 5. Sagittal plane cephalogram of a mandibular prognathism.



6A 6B 6C

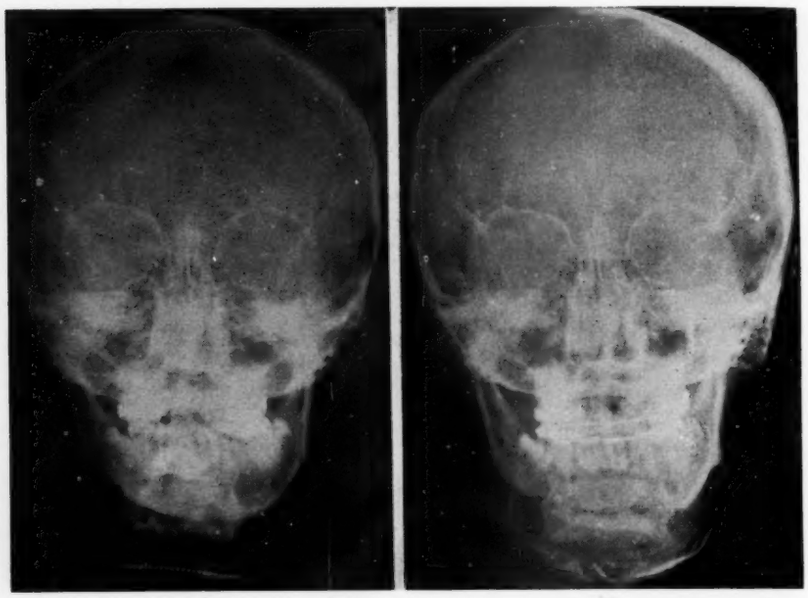
FIG. 6. Tracings made from the cephalogram in Figure 5. A, tracing of the soft tissue profile. B, cephalographic diagnostic planes and angles drawn on a tracing of the bony structure shown in Figure 5. C, diagnostic postoperative view; the posterior extension of the ramus is indicated.

the mandibular rami is decided upon as the surgical method for correction in this case, removal of the posteriorly placed portion of the ramus on each side of the jaw is indicated to prevent possible crowding of the oropharynx or pressure upon the facial nerve in such cases, as reported by Kazanjian;[17] it will be recalled that the trunk of the facial nerve enters the parotid gland in the retromandibular area. Removal of the overextended part of the ramus may then be anticipated, as indicated in Figure 6C.

If section of the rami is not indicated, the removal of the measured bone may be accomplished by osteotomy of the body of the mandible. A study of the cephalogram and the tracings made from it facilitates the diagnosis and aids in the decision as to the choice of the surgical procedure to be employed.

CASE IV. Figure 7 shows preoperative and postoperative cephalograms of facial asymmetry.

Figure 8 consists of superimposed tracings of the postero-anterior views of the cephalograms shown in Figure 7.



7A 7B

FIG. 7. Postero-anterior cephalogram of a facial asymmetry. A, preoperative view. B, postoperative view.

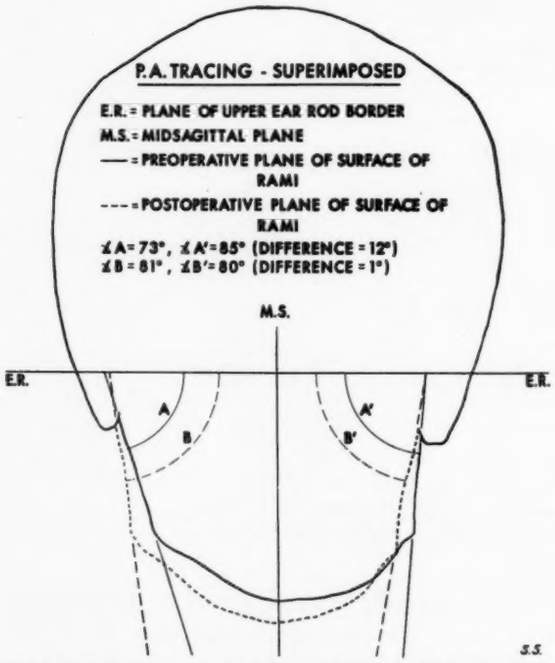


FIG. 8. Superimposed tracings of the cephalograms in Figure 7, indicating the cephalographic planes and angles drawn on the tracing.

Technic of Cephalographic Diagnosis in Case IV. A horizontal plane is drawn on the tracing of the cephalogram (Fig. 8) through the upper borders of the ear rods of the cephalostat; the upper border of the ear rod in the external auditory meatus represents the anthropometric point known as porion. The horizontal plane thus established is bisected by a line drawn in the mid-sagittal plane.

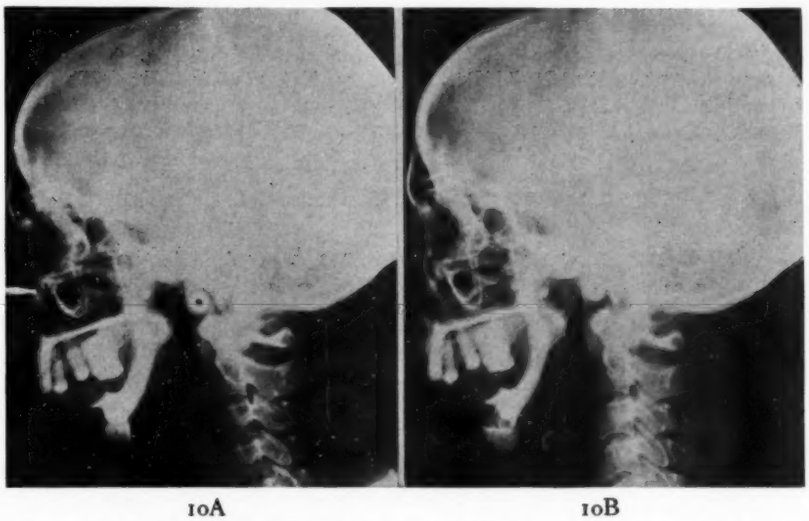
The outer surfaces of the rami of the mandible are then employed as planes upon which projected lines intersect the ear rod plane previously established. The angles formed at the intersection of these lines differ on both sides of the head; it will be noted that the angle A is 73 degrees; the angle A′ on the opposite side is 85 degrees, the asymmetry of the face thus including a difference of 12 degrees.

In order to improve the asymmetric appearance of the face the angle A should correspond as nearly as possible to the angle A′. It will be seen that the diagnostic angles B and B′ have been established at 81 and 80 degrees, respectively, and that diagnostic planes have been projected from the ear rod plane, thus establishing a measurable distance between the preoperative planes drawn on the outer surface of the rami and the diagnostic planes. Bilateral osteotomy of the body of the mandible then permits the insertion of previously measured bone grafts where indicated.

CASE V. Figure 9 consists of preoperative cephalograms of a deformity of the lower portion of the face; the soft tissue profile is shown in A; the skeletal structure is seen in B; the postero-anterior view is shown in C.

9A 9B 9C

FIG. 9. Sagittal plane cephalograms of a deformity of the lower portion of the face. A, preoperative soft tissue profile view. B, preoperative view of the bony structure. C, preoperative postero-anterior view.



10A 10B

FIG. 10. Later sagittal plane cephalograms of the patient shown in Figure 9. A, first postoperative stage showing bone graft. B, second postoperative stage showing additional bone graft.

Figure 10A and B show cephalograms of first and second stages in the surgical correction of the condition, in which bone grafts were added to the body of the mandible to increase the length of the jaw and to establish a base for a prosthesis.

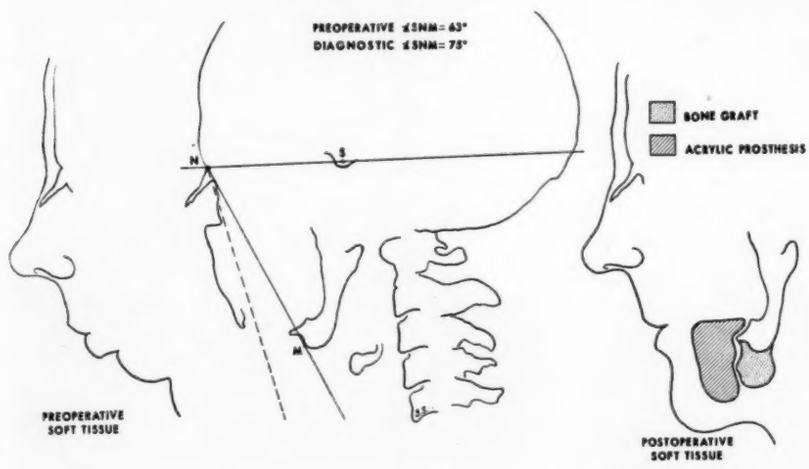
Figure 11A and B show sagittal plane and postero-anterior views of the patient following the establishment of a skin-grafted buccal sulcus and the insertion of an acrylic buccal prosthesis by which the skin graft is stabilized.

Figure 12 consists of tracings made from the cephalograms shown in Figures 9, 10 and 11. Figure 12A is a tracing of the preoperative soft tissue profile; B is a tracing of the preoperative bony structure; C is a tracing of the postoperative sagittal plane cephalogram shown in Figure 11.

Technic of Cephalographic Diagnosis in Case V. The angle formed at the intersection of the cranial base line and the facial plane in Figure 12B is 63 degrees. Increasing this angle at nasion to the average measurement, 75 degrees, establishes a diagnostic facial plane anterior to mentum. The distance between the two facial planes at mentum is measured, and

11A 11B

FIG. 11. Postoperative sagittal plane cephalograms of the patient (Figs. 9 and 10). A and B respectively, Sagittal plane and postero-anterior cephalograms of patient (Figs. 9, 10, 11) following establishment of a skin-grafted buccal sulcus and insertion of an acrylic buccal prosthesis.



12A 12B 12C

FIG. 12. Sagittal plane tracings of the cephalograms in Figures 9, 10 and 11. A, tracing of the preoperative soft tissue profile. B, tracing of the cephalogram in Figure 9B indicating preoperative diagnostic cephalographic planes and angles. C, tracing of the postoperative sagittal plane cephalogram in Figure 11A. The bone grafts and buccal prosthesis are indicated.

a prosthesis of similar dimension may then be constructed.

Figure 12C is a tracing made from the postoperative sagittal plane cephalogram shown in Figure 11; the dotted area represents the area rebuilt by the bone grafts shown in Figure 10A and B. The lined area represents the bulk of the prosthesis in the skin-grafted buccal sulcus.

This case demonstrates not only the diagonsis by cephalographic means of the dimension required to improve the profile of the patient, but also the dimension needed to reconstruct the vertical portion of the lower face.

Certain esthetic values are employed as a basis for establishing the dimension required for elongation of the body of the mandible. The values used for this purpose are based upon accepted esthetic dimensions in length of the symmetric face. These art values divide the length of the face into three measured components, the distance from the subnasal

level to the level of the mouth slit being equivalent to one-third of the distance from the subnasal level to the lower border of the chin.

Figure 13 includes three tracings made from the cephalograms of this case shown in previous views. Figure 13A is a tracing of the preoperative postero-anterior cephalogram; B is a tracing of the postoperative sagittal plane cephalogram; C is a tracing made from the postoperative postero-anterior cephalogram.

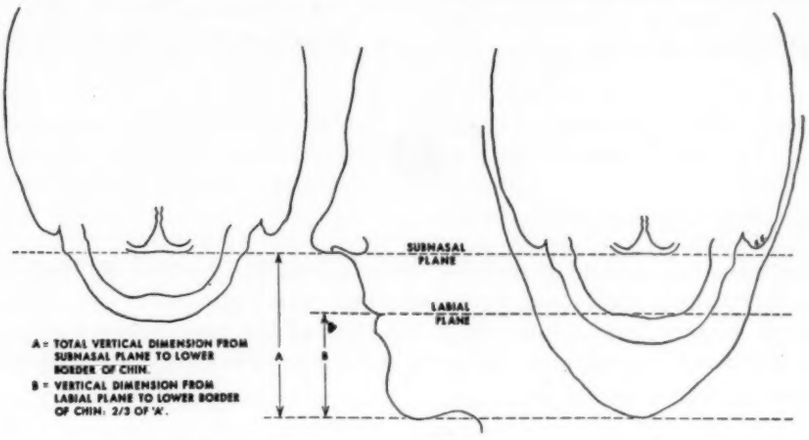

SUBNASAL PLANE
LABIAL PLANE
A = TOTAL VERTICAL DIMENSION FROM SUBNASAL PLANE TO LOWER BORDER OF CHIN.
B = VERTICAL DIMENSION FROM LABIAL PLANE TO LOWER BORDER OF CHIN: 2/3 OF 'A'.
A
B
13A
13B
13C

FIG. 13. Tracings of the cephalograms in Figures 9 and 11, indicating technic of cephalographic study of vertical dimension. A, tracings of the preoperative postero-anterior cephalograms in Figure 9. B, tracing of the postoperative sagittal plane cephalogram in Figure 11. C, tracing of the postoperative postero-anterior cephalogram in Figure 11.

These tracings have been arranged in Figure 13 in such a way that the subnasal plane is common to all three views. The distance from the subnasal level to the lower border of the chin is represented by the vertical line A; the vertical line B represents two-thirds of the distance from the subnasal plane to the lower border of the chin, which is equivalent to the vertical dimension requiring reconstruction. It can be seen that the length achieved in this case corresponds to the desired length of the face, based on established principles of esthetics, and results in a symmetric appearance as shown in Figures 11 and 13.

SUMMARY AND CONCLUSIONS

1. Technics are described for a method of preoperative cephalographic diagnosis to serve as an aid in reconstructive plastic surgery of facial malformations.

2. Sagittal plane and postero-anterior cephalograms of a number of varieties of facial malformations are shown and discussed.

3. Symmetric results rather than absolute mathematical data have been sought in this study.

4. The practical value of such preoperative cephalographic diagnostic studies in cases of facial malformations is stressed.

Acknowledgment: We wish to thank Mr. Sidney Shapiro, scientific and medical photographer, who prepared the illustrations for this presentation.

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Salivary calculi can invariably be removed via a small intraoral incision if one has patience and waits until the stone approaches the orifice of the duct. Most calculi are found in the duct of the submaxillary salivary gland, a few in the sublingual duct and still fewer in the duct of the parotid. (*Richard A. Leonardo, M.D.*)

Management of Intraoral Cancer and Its Treatment with Radical Surgery*

GRANT E. WARD, M.D. AND ROBERT G. CHAMBERS, M.D., *Baltimore, Maryland*

THE term intraoral cancer means cancer occurring from the soft palate and anterior pillars of the fossae forward to the inner side of the lips.

For purposes of discussion, intraoral cancer may be grouped according to location in: the tongue and floor of mouth; the buccal mucosa and lower gingiva; and the palate and upper gingiva. The lesions in each group have similar development, treatment and prognosis. Statistically the death rate for intraoral cancer is about 1.4 per cent per hundred thousand population.

The differential diagnosis of malignant tumors in the mouth lies between similar groups of neoplasms and inflammatory processes, especially syphilis and tuberculosis, that are most frequently found in the oral cavity. The treatment of tumors of the upper gingiva and palate present similar problems as to development, and erosion of the antrum may result in each. Carcinoma of the buccal mucosa and lower gingiva, and alveolus have similarities as do the neoplasms of the tongue and floor of the mouth.

Many etiologic factors, some still quite controversial and unproven, may contribute to the origin of cancer of the oral cavity. Perhaps the most common is trauma. There is some, as yet unknown, biological factor which underlies the development of carcinoma, for trauma occurs in many patients in whom cancer never develops. Ragged teeth and poor dental hygiene often precede cancer of the buccal mucous membrane. Malfitting, loose or sharp-edged dentures may hide a malignant ulcer for weeks or months. Tobacco is certainly an irritant, although its exact role has still not been established. The relationship of leukoplakia to cancer in the oral cavity is readily admitted. The authors, at present, are engaged in a long-term project to discover the exact association of leukoplakia and cancer.

The three most prominent lesions of the oral cavity to be distinguished from cancer are the chronic ulcers found in tertiary syphilis and tuberculosis, and ulcerated, thickened leukoplakia. Other lesions such as psoriasis, lichen planus, granulomas, the acute ulcers of trauma and Vincent's angina, secondary syphilis and athromatous ulcers may occasionally require differentiation. The differential diagnosis has been adequately and extensively described in the numerous texts and papers on the subject; therefore, we will not elaborate. It should be stressed that adequate biopsy and subsequent accurate pathologic study is the only real diagnostic procedure that determines the presence or absence of cancer.

In the majority of cases the clinical diagnosis of malignant disease in the oral cavity is not difficult for the trained eye and fingers. Despite the intensive educational propaganda, both lay and medical, during the past two decades, there are far too many patients referred with extensive disease, partly due to the patient's neglect and partly to the ignorance of the physician or dentist first consulted.

The most common malignant tumor of the oral cavity is squamous cell carcinoma, which may be papillary, sessile, ulcerative or infiltrative in character. Adenocarcinoma may arise from embryonic mucous gland epithelium or mucosal salivary tissue and usually involves adjacent bone early in its course. Carcinoma or sarcoma may arise from aberrant salivary tissue tumors located at any position in the mouth. Sarcoma is an extremely rare lesion in the buccal cavity. We have had three cases of malignant melanoma, primary in the oral cavity. Such systemic diseases as lymphosarcoma

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and leukemia occasionally are first noted in the oral cavity.

Except for a selective group of early lesions, the best chance of cure lies in the field of radical surgery, provided it offers a reasonable degree of comfort, function and rehabilitation. The patient is little better off, despite the eradication of his cancer, if the results of radical surgery make him a social and economic outcast. The authors, insofar as possible, carry out a well planned plastic reconstruction at the time of radical extirpation of the tumor. Radical surgery should, therefore, aim at two goals: (1) removal of the primary tumor, along with the primary pathways of lymphatic spread; (2) the cosmetic and functional rehabilitation of the patient. Radical extirpation of the cancer should be without consideration of important but not essential anatomic structures (that is, the internal carotid artery) for uncontrolled cancer of the oral cavity is unequivocally a fatal disease.

Although many of the technical procedures employed today were first conceived by Kocher, Butlin,[1] Crile[3] and others,[12] it is only since the advent of antibiotics, the advancement in anesthesiology, the unlimited supplies of whole blood, and the facilities for sustaining parenteral feedings for long periods of time that extensive resections for oral cancer have become feasible. During the past decade, operative mortality and morbidity has been reduced to such an extent as to make radical surgery for cancer of the mouth practicable.

Carcinoma of Tongue and Floor of Mouth. Embryologically, the tongue and the floor of the mouth arise from the first and second branchial arches. The clinical behavior of cancer in each location is similar, except that cancer of the floor of the mouth more commonly involves the mandibular periosteum and metastasizes earlier to the upper neck.

Cancer of the tongue is most often located along the lateral border of the middle third. The next site in order of frequency is the base or posterior third, then the anterior third and the least involved is the under surface of the tip. We have never seen a case of cancer beginning in the median rhomboid region just anterior to the circumvallate papillae. However, we have observed several papillomas and recently excised a rhomboid area in a youth of twenty-six years in whom there was a disturbing amount of cellular mitosis in a papilloma located in this region. Cancer of the floor of the mouth usually arises in the anterior portion, especially at the junction of the tongue and the floor of the mouth. Occasionally the tumor begins in a papilloma in close proximity to Warthin's duct.

Pain is rarely a primary symptom unless the tumor is rapidly invasive or entirely submucosal and located at the base of the tongue. Usually the first symptom is the discovery of something abnormal on the surface of the tongue or floor of the mouth.

A few small cancers of the tongue are treated satisfactorily by irradiation therapy or wide local excision, especially with electrosurgery. An occasional small cancer of the floor of the mouth can be eradiated with radium therapy. Usually tumors so treated are 1 to 2½ cm. in greatest diameter and located in the anterior part of the mouth or anterior third of the tongue. Intraoral x-ray cones have a limited place in the treatment of an occasional small cancer on the anterior one-third of the tongue. Great care must be exercised in focusing the cone and maintaining the application accurately. Cancer of the floor of the mouth cannot be adequately treated with an intraoral x-ray cone. Radon seeds and radium element needles are of great value in eradicating carefully selected small cancers of the anterior third of the tongue and an occasional cancer of the floor of the mouth.

The patient should wear for ten or twelve days a lower denture having a built-in lead shield which covers the area containing the seeds and protects to some extent the hard palate and upper gingiva and, if possible, the mandible. When radium needles are used, the lead shield is worn only as long as the needles are in place. The dose should be calculated according to one of the accepted standard dosage tables (Peterson et al. and Quinby et al.[5]). We have had no experience with the use of radium molds applied externally for protracted treatments as practiced by English radiologists.

An ever present danger following implantation of radon seeds or radium element needles is the complication of radio-osteonecrosis of the mandible which may appear from two months to two or three years, or occasionally longer, following treatment. To lessen the possibility of this undesirable and painful process, all teeth near the area of disease should be extracted prior to treatment.

Elderly or debilitated patients form another group in whom radiation is at times preferable to surgery for cancers of the tongue and floor of mouth, both small and extensive.

In the majority of cases of cancer of the tongue and floor of mouth, however, we now employ immediate radical surgery for resectable lesions. Occasionally, preoperative irradiation therapy is given for those lesions that are too large for a successful primary cancer operation. The operation of choice is hemiglossectomy and neck dissection in block, by the composite procedure with or without taking a section of the mandible. The possible exceptions are: (1) Small local cancers on the tip, particularly papillary in type. These are slow to metastasize, non-infiltrative and yield to wide local excision. (2) Extremely poor operative risks in the aged and debilitated. Even here the often-quoted phrase of Jules Able, "There are no medical contraindications to cancer surgery," must be borne in mind. We believe that it is the duty of the medical consultant to see to it that the patient is in the best possible condition to undergo radical surgery, rather than to say that the patient should not be operated upon because of some co-existing systemic disorder. (3) Patients who refuse surgery.

Our reasons for no longer adhering to the combination of preoperative irradiation and surgery, or irradiation alone for the treatment of the local growth are: (1) Twenty-five per cent of excised local growths in the mouth following adequate irradiation still retain viable cancer cells. (2) Many patients will refuse the much-needed neck dissection following the successful alleviation of the primary growth by irradiation. (3) Radiation therapy given in sufficient quantities to eradicate cancer in the mouth causes permanent damage in the surrounding tissues, especially bone, resulting in a high incidence of secondary necrosis. (4) Preoperative irradiation affects such changes in the surrounding normal structures as to make the cosmetic rehabilitation with grafts, etc., doubly difficult.

We have successfully employed a V-excision of the tip of the tongue with primary closure for tiny, early lesions. In aged and debilitated patients, a simple hemiglossectomy to include the primary lesion, when located at or near the edge, will frequently allow the patient to live his remaining years in comfort. The resection may include the floor of the mouth, if this is also involved. The wound may be left to granulate or it may be closed by suturing the upper and lower surfaces together or by a split-thickness graft held in place with suitable stent. V-excision and hemiglossectomy are greatly simplified by the use of the electrosurgical cutting current.

Since 1947 we have combined hemiglossectomy with radical neck dissection as the procedure of choice with the foregoing exceptions even though no nodes are palpable. This we consider mandatory since 25 per cent of the patients with cancers of the tongue and floor of the mouth without palpable nodes will sooner or later develop neck metastases. This operation may be performed in one or two ways: (1) The composite operation in which the neck dissection is begun at the clavicle and carried upward to include the mandible, floor of the mouth, half of the tongue, and a portion of the pharynx when involved, *en bloc*. (2) An alternate method is the so-called "pull through operation" in which the radical neck dissection is done and the mandibular attachments of the muscles of the floor of the mouth and tongue muscles are loosened. The lower skin flaps are closed and the hemiglossectomy is performed by pulling the tongue down beneath the jaw into the neck wound. In the pull-through operation the mouth may be closed by reconstructing the floor of the mouth with the tissues that remain or by a graft.[13] However, the composite procedure usually necessitates the use of some type of skin-grafting or flap-shifting for better functioning of the tongue, both in speaking and eating. This can be done by the formation of a delayed double-pedicle apron-flap two weeks prior to the definitive operation.

At a preliminary operation, two weeks prior to the resection, a long vertical neck flap with the pedicle at the upper end overlying the mandible is raised. The lower end of the pedicle flap is turned on itself forming a full-thickness apron. The top of this apron may be sutured to the soft tissues of the cheek when the mandible is to be sacrificed or to the periosteum of the lingual side of the mandible, when the jaw is to be saved. A drain is passed between the flap and the turned under apron, forcing the circulation through the upper end of the apron only. The raw surface of the neck is covered with a split-thickness graft. (Fig. 1.) After ten days the apron portion of the graft is

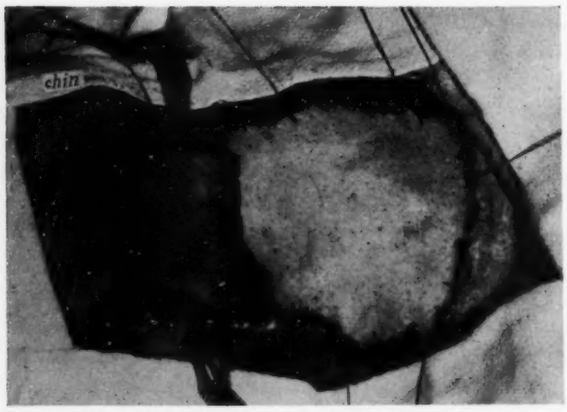


FIG. 1. Neck flap has been turned under on itself to form an apron flap and the distal end sutured high under the base when the jaw is to be resected. If the jaw will not be removed, the apron flap is sutured to the periosteum or the lingual side of the mandible high up under the mucous membrane of the floor of the mouth after cutting the mandibular attachment of the mylohyoid muscle.*

cut away from the main pedicle with one or two "delays" spaced a day or two apart. This apron is now used to replace the floor of the mouth that will be excised with the resected specimen.[12] A new floor of the mouth also may be made by lining the elevated upper cheek flap of the modified Kocher Y skin incision with split-thickness skin grafts. Mandibular alignment is maintained by the insertion of a stainless steel bar to bridge the gap of the resected mandible, or by the use of the Haines' external fixation apparatus. Alignment may also be obtained adequately by the immediate insertion of a guide-plane dental prosthesis in patients who have a sufficient number of teeth to hold clasps. Immediate bone grafts, preferably cancellous bone from the ilium, have been successfully employed when there is ample soft tissue to cover the bone satisfactorily to assure the development of adequate circulation in the grafted bone. (Fig. 2A to 2D.)

Since the inception of these procedures the authors have operated upon fifty-six private patients with an operative mortality of 10 per cent. Of these, three operative deaths can be attributed to acute respiratory obstruction. It is now the rule to perform a preliminary tracheotomy prior to the operation. One death is accounted to non-resectability; this patient succumbed to fatal hemorrhage from the common carotid artery whose wall was weakened by tumor invasion. We hope to increase the scope of the procedure by the free use of homoarterial grafts in the more extensive cases. Another patient with extensive disease died of hemorrhage because the ligature on the stump of the external carotid artery cut through an athromatous plaque on the seventh postoperative day. The sixth patient died from a coronary occlusion on the sixth postoperative day. The seventh patient succumbed to an operation for removal of the steel bar two and one-half months after the composite procedure. Death was due to respiratory obstruction after removal of the endotracheal tube and cardiac arrest.

All patients who survived the operation and in whom disabling recurrences did not develop have been rehabilitated; one as a minister, one as an auctioneer, one as a physician, one as a newspaper editor, and others as business men, factory workers, stenographers and housewives.

Of the total number of fifty-six private patients, there have been eleven recurrences; nine of these patients have died. Many of these patients have been operated upon too recently to give five-year survivals.

Carcinoma of Buccal Mucosa and Lower Gingiva. Carcinomas of the cheeks comprise about 9.5 per cent of all intraoral tumors, being the third most frequent site after carcinoma of the tongue and lip. The mid-portion of the cheek opposite the occlusal level of the teeth is the site most frequently involved, although the disease may originate at any point. A noticeable number of carcinomas arise near the labial commissures. Buccal lesions usually extend to involve the adjacent structures, particularly the mandible or the maxilla early in the course of the disease. Carcinomas arising in the posterior portion of the mucosa near the angles of the jaws, are particularly treacherous as they quickly involve the mandible, masseter muscles and invade the ptyergoid fossa.

Chronic irritation is obviously the most common etiologic factor in carcinoma of the cheek, more so than in any other type of intraoral cancer. The buccal mucosa is so situated as to be easily irritated by the teeth, especially by sharp or ill fitting dentures, and by tobacco. It is generally assumed that leukoplakia is a very common, precancerous lesion in the oral mucous membrane. Intraoral leukoplakia occurs most often in mucosa of the cheek. Preexisting leukoplakia has been reported to have

* Figures 1 to 5 published through the courtesy of Williams & Wilkins Co.[12]

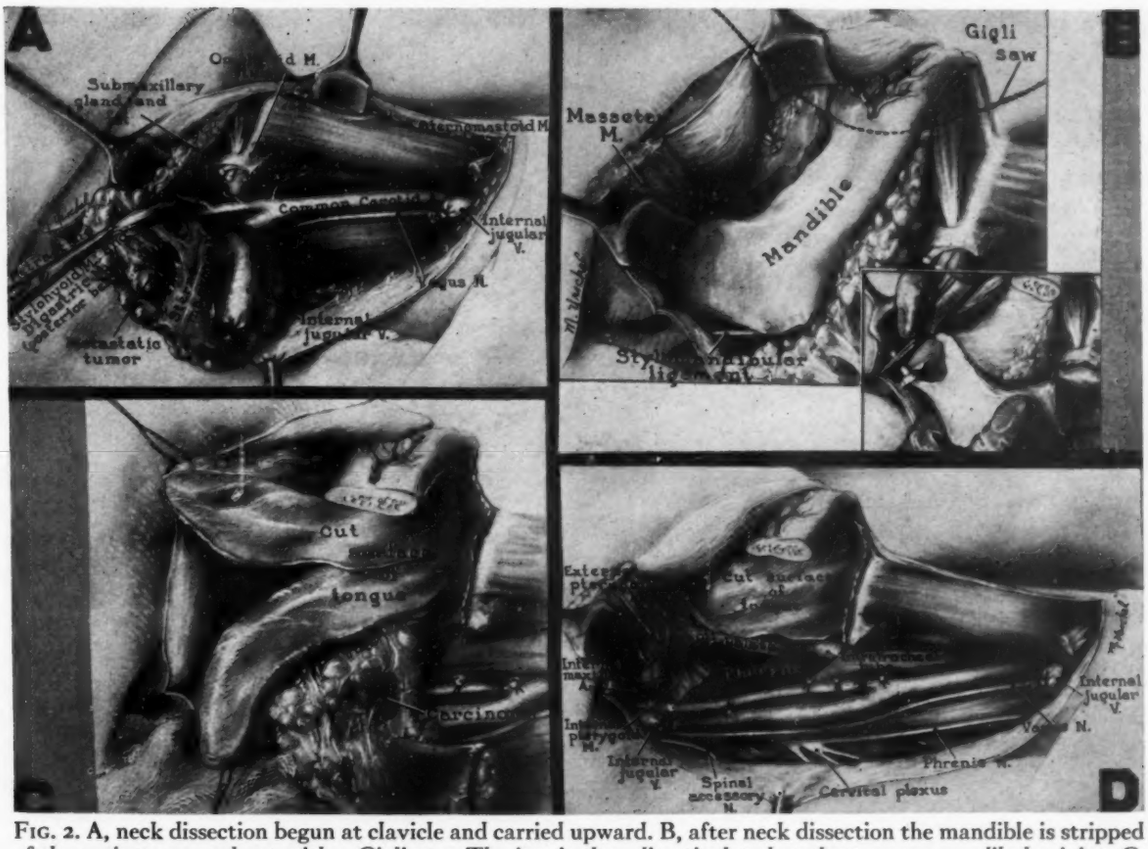


FIG. 2. A, neck dissection begun at clavicle and carried upward. B, after neck dissection the mandible is stripped of the periosteum and cut with a Gigli saw. The jaw is then disarticulated at the temporomandibular joint. C, tongue is split down the middle. The resection of the tongue and floor of the mouth may be from the front or back depending upon where the oral cavity or pharynx was opened. D, view of mouth and pharynx after removing tongue, tumor and nodes of the neck.

occurred in anywhere from 22 to 70 per cent of the cancers of the cheek. Leukoplakia is assumed to be such a predisposing factor in carcinoma of the buccal mucosa that we strongly aver that all cases of leukoplakia should be observed carefully for long periods of time, and treated vigorously with all means at hand. Our plan for treatment of leukoplakia is the complete avoidance of tobacco, a normal saline, normal temperature mouthwash every two hours, 100,000 units of vitamin A and 500 mg. of vitamin C every day. Leukoplakic lesions that are small may be removed with electrosurgery; larger areas often will respond to 1,200 to 1,800 roentgens given over a period of two weeks. Recently we have seen some widespread leukoplakias respond fairly well to estrogen hormones using from 2 to 5 mg. a day, both in the male and female.

The most successful treatment of carcinoma of the cheek is both by irradiation and surgical excision. Irradiation seems to offer the best results in small- and moderate-sized buccal lesions. Using an intraoral cone 4,000 to 5,000 roentgens over a ten-day period, or 6,000 to 7,000 roentgens over a three to four week period, is the ideal dosage in our hands. Persistent or recurrent lesions are removed widely with electrosurgery. The more extensive lesions require resection of the entire cheek and adjacent involved bone, followed immediately by plastic repair, with appropriate skin flaps. Occasionally, it is necessary to resect one table of the mandible or a portion of the maxilla. When the growth has destroyed the bulk of the soft tissues of the cheek and attached itself to the skin, the skin, of course, must be widely sacrificed. When the entire mandible is removed, the opposite mandible and chin are prevented from drifting to the operative side by the same methods employed in the composite operation.

Carcinoma occurring far back on the buccal surface near the angles of the jaws gives a per-

sistently poor prognosis, either by irradiation, combined irradiation and surgery, or radical surgery.

Until recently, the authors were in agreement with the majority of their colleagues in not advising neck dissection for carcinoma of the buccal mucosa when the nodes are not palpable. However, during recent months, certain doubts have arisen as to the accuracy of this belief. It is usually reported that 50 to 60 per cent of the carcinomas of the buccal mucosa do not metastasize, assuming that the primary lesion was adequately treated. Also, it has been averred by many investigators that prophylactic radical neck dissection in dealing with this lesion should be held in abeyance, until the appearance of cervical metastases. However, it should be remembered that composite and pull-through procedures are based on the assumption that 25 per cent of patients with carcinoma of the tongue without palpable nodes when first seen, will subsequently develop metastatic nodes. It, therefore, seems a little inconsistent to base a radical *en bloc* operation on a 25 per cent figure for carcinoma of the tongue and withhold the same type of prophylactic removal of pathways lymphatic spread despite a figure of 50 per cent for carcinoma of the buccal mucosa. We have, therefore, begun to question the advisability of not doing a prophylactic neck dissection, coupled with the previously mentioned treatment of the local lesion. It has been our practice to combine a radical neck dissection and *en bloc* removal of the local lesion, and to combine a radical neck dissection and *en bloc* removal of the local lesion when there has been involvement of the skin.

FIG. 3. Diagram showing Fergusson incision modified with extension across bridge of nose permitting nose to be turned back exposing both nares. (Technic of Bordley and Longmire.)

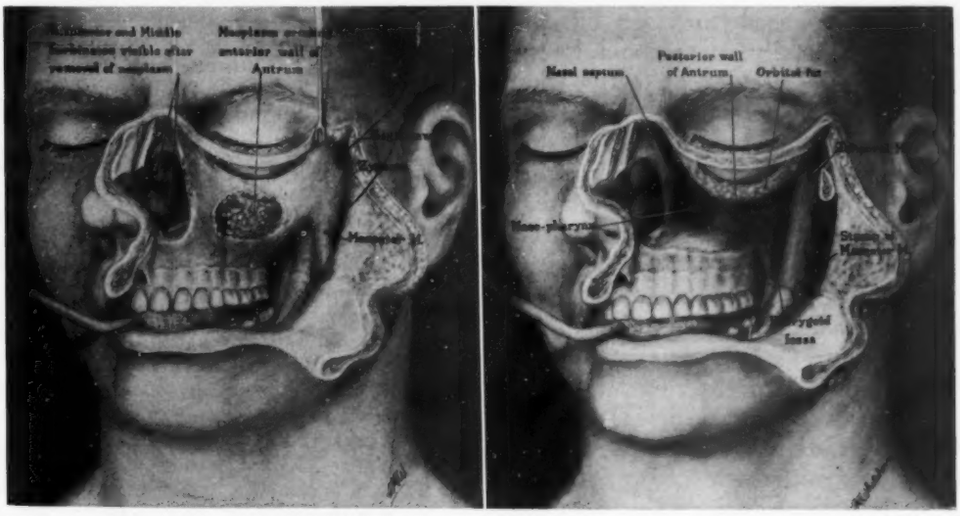
In the few complete series of cases that have been reported, the five-year survival rate of patients having carcinoma of the buccal mucosa ranges from 9 to 40 per cent.

Carcinoma of Palate and Upper Gingiva. Squamous cell carcinoma is the most common malignant tumor of the palate. Adenocarcinoma of the mixed tumor type is the next most frequently occurring malignancy. Sarcomas and melanomas are occasionally seen on the hard palate and upper gingiva. The authors have had several cases of cylindromas, that is, basal-cell carcinoma of mucous membrane origin, each of which destroyed large areas of bone.

The tendency now in treating squamous cell cancer of the gingiva and hard palate is to rely upon irradiation to destroy the primary growth and to resect the neck lymph nodes when they are palpable. However, since very heavy irradiation is necessary to eradicate carcinoma, complications of secondary irradiation necrosis of the soft parts and bone often require subsequent surgical removal of the primary site. In view of this complication, and since recurrence is frequent after irradiation, we have adopted the routine of a combined course of therapy. The primary lesion is first heavily irradiated. Then four to six weeks later it is removed electrosurgically with a wide margin.

Adenocarcinomas of the mixed tumor type should not receive preoperative irradiation since they are radio-resistant. Surgical removal is the only sure method of cure. Occasionally, small lesions can be locally excised with a generous margin of surrounding tissue and the wound left to granulate. If the tumor extends into the nose and maxillary sinus, a much wider removal is necessary, including as much of the maxilla as is indicated to eradicate the growth. Radium tubes are applied at the time of operation whenever there is a question as to whether the entire tumor has been removed.

Many patients having cancer of the upper gingiva come late for treatment, and since they invade bone early, we have made it a routine to perform an extraoral radical procedure when there is any roentgenologic evidence of invasion of the maxilla, and especially the antrum.



4 5

FIG. 4. Cheek completely turned back. Neoplasm has destroyed anterior wall of antrum, and also extended into pterygoid fossa and nasopharynx.

FIG. 5. Electrosurgical removal of tumor completed. In this case it was not necessary to remove the maxilla. Closure and reconstruction will be accomplished by suturing a split-thickness skin graft to inner surface of cheek and over temporal and pterygoid muscles and under surface of orbit. The cheek is sutured to its original bed.

Often at operation the growth is found extending well up into the bone, either along the latero-antral or naso-antral wall, to a much greater extent than was demonstrable clinically or roentgenologically. We prefer to use a modified Fergusson incision, as for removal of the superior maxilla. A skin incision is made with a scalpel, beginning at the middle of the upper lip passing upward to the columella of the nose, thence around the ala on the affected side and up along the border of the nose to the level of the floor of the orbit. The incision is extended through the skin and mucous membrane of the lip down to the bone. . . . The horizontal limb then extends out across the cheek at right angles to the first and at the level of the lower border of the orbit and is carried as far as necessary for thorough exposure. The cheek is dissected off the maxilla and an incision is made in the mucous membrane of the vault of the gingivobuccal sulcus and carried back to the alveolar tuberosity. With a surgical cutting current an incision is then made through the mucosa of the midline of the palate at a safe distance from the growth, then laterally behind the tumor to the cheek. The midline of the upper jaw is cut through with hammer and chisel. Any other bony attachments are similarly severed with hammer and chisel, or bone cutters. The entire area of involved jaw is then removed. Occasionally, it is necessary to remove the entire superior maxilla, in a combined gingival and antral carcinoma. If the naso-antral wall and palate are not involved, they are left untouched. If these structures are involved, the operation is extended in scope, even to exenteration of the orbit, a rare necessity. These patients are rehabilitated with prosthesis of sufficient size to cover the wound, aiding in talking and preventing food from getting up into the nasopharynx or nose. (Figs. 3 to 5.)

Malignant tumors of the hard palate are in difficult areas to reach with an intraoral x-ray cone and may be treated with radium held in place by a leaded resinous applicator. Small cancers of the lower gingiva, that is those under 2 cm. in diameter, may be treated by x-ray through an intraoral cone or by radium in a lead-lined applicator. However, these lesions should be removed with a wide margin electrosurgically within four to six weeks after treatment.

Cancer and malignant tumors of the soft palate are extremely rare. The majority of these are squamous cell carcinomas. All are quite sensitive to irradiation and may be treated by delivering 5,000 to 6,000 roentgens through an intraoral cone in two weeks, or the entire soft palate may be removed surgically with excellent results. Here again prosthetic

appliances must be used to close off the nasopharynx. Occasionally, a sarcoma is encountered. These are best treated by wide surgical excision. Radical removal of the soft palate is a fairly simple procedure and surprisingly bloodless when the operation is done with the electrosurgical cutting current. A pedicle flap of mucosa may be created from the posterior pharyngeal wall and attached to the posterior end of the hard palate to close off partially the nasopharynx. On the other hand, a denture having an extension backward prevents fluids and food from entering the nasopharynx. In those soft palatine lesions which are treated with irradiation, healing seems to take place quickly, with little deformity and surprisingly little radionecrosis.

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Gelatinized Bone*

ITS ROLE IN MAXILLOFACIAL SURGERY

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THE reconstruction of skeletal defects in the realm of maxillofacial surgery often demands the use of some substance other than those tissues in juxtaposition to the defects. In an attempt to alleviate additional surgery, various substances of a heterogenous nature such as beef bone, ivory, metals (vitallium® and tantalum) and the acrylic resins have been employed. Unfortunately, they are far from ideal due to their hardness and rigidity, as slight trauma may dislodge them causing deformity or encystment which will make their position untenable. Homogenous materials, particularly cartilage and bone, have been given marked consideration especially because of their availability in quantity without an additional surgical procedure. Although they serve quite well, there is much to be desired in them when a comparison is made with autogenous tissues of this type. Autogenous cartilage is restricted in quantity as the largest single piece available is from the costal bar, following which an area of tenderness persists long into the postoperative period and restitution is very slow or absent. Bone of the cancellous type is readily obtained from the iliac crest in large quantities with a minimum of surgical effort and minimal postoperative discomfort to the patient. The more finely divided bone particles revascularize most rapidly stimulating healing and averting absorption. In order to facilitate the handling of these finely divided particles of bone, it is necessary to develop a conglomerate mass which can be accomplished by gelatinization with powdered gelfoam.®†[3–5]

Experimental studies in which various combinations of ground bone (macerated in a conventional meat grinder), whole blood and powdered gelfoam were implanted upon the horioallantoic membrane of seven-day incubated fertilized hen's eggs, revealed the preferable formula, namely, ground cancellous bone:whole blood::2:1 by volume 8:1 powdered gelfoam.[3–5]

Not only was this mixture found to heal well but also it seemed to accelerate the healing. In rabbits in which a series of fibular bone defects were made by removing an entire section of the bone with a rongeur in the control leg by replacement of the fragment and in the other leg with embedding of the fragment in gelatinized bone, it was noted that healing was accelerated 40 per cent.

An attempt to discover why the healing was enhanced to this degree raised many complex problems as to whether the acceleration was influenced by (1) regulation of the pH during the healing period, (2) introduction of an available quantity of calcium salts, (3) introduction of a large number of active osteoblasts, (4) increase in alkaline phosphatase present in the ground bone, (5) introduction of an organizer substance. It has not been determined which of the five possibilities is the predominant factor, but our experiments have shown that such an acceleration factor (or factors) does exist and is present in the gelatinized bone mass. Confirming our studies, another investigator notes that the regrowth rate of ground bone mass was twice that of periosteum alone, and one-third greater than that from bone chips.

PREPARATION OF GELATINIZED BONE

A portion of the iliac crest with the inner plate is cut into small pieces with a cutting forceps or a chisel. These small fragments are put through a meat grinder with a fine perforated outlet in order to produce particles 1 mm. or less in size. The resultant material

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† Manufactured by the Upjohn Company, Kalamazoo, Michigan.

is mixed with the patient's fresh whole blood in the ratio of 2:1 by volume. An eighth part of powdered gelfoam is added and the preparation is mixed thoroughly. In a short time it attains a gelatinous consistency and is ready for immediate use.

mass may be introduced with a syringe and hollow needle (10 to 12 gauge). Only a syringe with a large bore nipple can be used and it is well to have it equipped with a strong finger ring. The periosteum may be elevated by the pressure of the mass or by the use of a small

TABLE 1

USE OF GELATINIZED BONE IN EIGHTEEN CASES

Location	Cause of Condition	Method of Repair	Length Postoperatively (mo.)	Type of Bone
Malar Depression (7 Cases)				
Unilateral (6)	Auto accident 5	Needle and syringe	55, 48, 43, 32, 25	Autogenous
	Industrial accident 1	Needle and syringe	29	Homogenous
Bilateral (1)	Congenital 1	Needle and syringe	14	Homogenous
Mandibular Deformities (11 Cases)				
Bilateral (4) (micrognathism, 3)	Gunshot wound 1	Open	99	Autogenous
	Congenital 3	Needle and syringe (used nasal hump)	38, 28, 15	Autogenous
Unilateral (7)	Fracture 5	Open 1, needle and syringe 4	42, 38, 33, 20, 18	Autogenous
	Tumor excision 2	Open	27, 4	Autogenous

TECHNICS

When the mass has become gelatinous, it may be introduced into the defect by one of two technics. In either of the methods the mass must be in contact with supportive structures, preferably bone but it does well in fibrous tissue. The mass does poorly in muscle or the soft tissues as it is absorbed.

If the recipient site has been opened by the initial surgery, the mass may be spooned into the defect and packed tightly; otherwise it would be necessary to expose the defect. This is necessary when extensive scarring is present or when the area has been covered by a thin skin graft. Scar tissue must be excised or elevated from an incision made along the site of the defect with a tunnel created to the desired site at which the soft tissue is elevated. The bone is freshened with a curet. Thorough hemostasis must be effected. The tissue is sutured in place to lend a slight pressure. The gelatinized bone mass can be molded with the fingers through the soft tissues.

In cases in which there is little or no scarring, such as in micrognathia, the gelatinized bone

periosteal elevator such as is used by the rhinologist in submucous resections. The material is introduced under slight pressure and molded into position. The position is retained with a pressure bandage or a molded splint of dental impression compound.

Seven cases of malar depression were treated when, in lieu of cartilage introduction with the resulting scarring which was formerly employed, the gelatinized bone mass was implanted through the hair-bearing skin of the temple with a syringe. It was in this type of case that needle introduction was first attempted in the human. (Table 1.)

The eleven mandibular deformities were of two types: The bilateral cases, micrognathism, were due to absorption of the mandibular rami caused mainly by trauma except for three congenital cases. The remaining seven had only one mandibular ramus involved, five in ununited fractures and two following excision of a tumor. In all of the congenital micrognathics the nasal hump was removed, ground up and introduced into the mental region to correct optically the micrognathism, as malocclu-

sion was not too pertinent a feature. If marked malocclusion is present, resection is required.

Under experimentation at the present time is the application of gelatinized bone mass for the reconstitution of the alveolar ridges. A subperiosteal tunnel is made into which the gelatinized bone mass is injected with a syringe. The mass is molded and held in place with an oral splint supported by external bar attached to a head band. The present results are gratifying but the postoperative time lapse is not sufficient to offer concrete proof of its efficacy.

SUMMARY

A preparation of gelatinized bone appears to be quite satisfactory for the reconstruction of skeletal defects and it seems to accelerate healing, is easily obtained and is readily introduced by open operation or needle method. Good results have been obtained in eighteen cases of a maxillofacial nature.

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The Treatment of Lip Deformities Resulting from Electric Burns

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ACCIDENTS associated with the use of various mechanical and electrical devices are fairly common in the average American home. The purpose of this paper is to report one type of such accident which seldom appears in the medical literature; the electric burn resulting from contact of the mouth with live electrical outlets. These observations are based upon experiences with fifteen such cases.

Baldridge,[1] in his discussion of the electrophysical aspects of electric burns, mentions two general types, arc and contact. In the former the involved area is heated by an electrical arc to a temperature of 2,500 to 3,000°C., resulting in a charring of the soft tissues and bone. In the latter there is an actual passage of current through the body from the point of contact to the point of "grounded" exit, with burns at both sites; death may ensue if the current traverses vital cardiac or cerebral centers.

In this series the burns are all of the arc type with tissue injury confined to the immediate area of the burn. The injuries described in this report occurred only in children ranging in age from nine months to four years; most of the accidents were in the one to two year age group. That the mishap occurs more frequently in the younger child is quite understandable, for while he is creeping or playing, the live electrical cord left carelessly on the floor or the wall outlet become objects of curiosity which must be tasted. The moisture of the mouth completes the electrical circuit and an arc results with serious consequences. If the child is wet or is touching a grounded object (i.e., a radiator), the current may pass through the body with possible electrocution. Although it is generally believed that voltages of 110 to 120 V. are not fatal, we know of one child who was electrocuted by contact with a live Christmas tree light socket and a radiator.

Unusual Features. In contradistinction to the usual thermal burn, the severity of the electric arc burn may not be apparent at first. Examination usually discloses a third degree burn with a centrally depressed charred crater and a slight elevation of the surrounding skin of a pale grayish color. Pathologic examination shows extensive coagulative necrosis which extends a considerable distance beyond the apparent limits of the wound. The media of blood vessels is disintegrated and occasionally leads to secondary hemorrhage during the sloughing process. Sensory nerves are widely destroyed, thus offering an explanation for the painless nature of the injury. The devitalized tissues slough very slowly, with a minimum of surrounding tissue reaction and tardy spontaneous repair. Injured bone is slow to sequestrate.

Deformities. In our series of cases the lips, alveolar processes and tongue were involved in burns of varying degree. The damage to the tongue is not usually severe, although in the initial stages the tip of the tongue may show considerable ulceration. Moderate damage is noted in more extensive cases when the floor of the mouth is involved, the tongue being bound down by cicatrix, interfering with normal motility of the tip.

Burns of the alveolar processes and the teeth are common, with resultant sequestration. Loss of the deciduous incisors may occur, but the development of the permanent teeth does not seem to be affected. The lips seem to suffer the most extensive damage; the lower lip is usually more severely burned than the upper. The entire thickness of the lip is usually involved, including the mucosa of the inner

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1A 1B

FIG. 1. A, photograph showing adhesion of upper and lower lips following electric burn. B, photograph following repair of the corner of mouth.

surface and the alveolar process. The contracting scar causes severe deformities as the wound heals. In cases in which the median section of the lip is lost, the lip becomes retracted and adherent to the alveolar process, with diminution in its horizontal and vertical dimensions, thus not only distorting the normal outline of the lips, but also interfering with normal function. When the corner of the mouth is destroyed, that part of both upper and lower lips becomes adherent and at times the disability is considerable. The scar tissue may interfere with the full opening of the mouth, in addition to causing considerable deformity.

Early Treatment. In the initial stage débridement followed by repair of the lesion does not seem to be the proper course to follow because of difficulty in ascertaining the depth of the injury. Judicious débridement of the wound is more advantageous after the slough has formed and the extent of the injury is known.

Repair of Deformities. Each case presents its own peculiar type of deformity. Judging from the cases in our series, however, there appear to be two principal types of deformity: (1) those which are limited to the corner of the mouth; (2) those involving the loss of a section of the lower lip. When the side of the mouth is involved, we have noted that the upper and lower lips are adherent for a certain distance from the corner of the mouth. (Fig. 1A and B.)

Reconstruction of the corner of the mouth is not a simple procedure in deformities of any origin and becomes more difficult when dense scar tissue is present. Two different procedures have yielded satisfactory results; the choice depends upon the amount of missing mucosa at the vermilion border. The adherent portions of the upper and lower lips are separated and the avascular scars are excised, enabling the surrounding tissues to regain their normal elasticity; the extent of healthy tissue needed for the repair then becomes more apparent. The skin loss seems to be negligible in most cases and only mucous membrane is required to re-establish the normal outline of the mouth. If the raw areas at the corners of the upper and lower lips are not more than 1 to 1½-cm. in length, an advancing flap from the adjacent vermilion lip will restore this area adequately. A horizontal incision is extended medially from the wound, through the full thickness of the lip, at the mucocutaneous line. The incision should be of a sufficient length to allow the vermilion flap to stretch to the new corner of the mouth, where it is anchored by a mattress suture extending from the tip of the flap through the subcutaneous tissues of the cheek, and brought out through the skin of the cheek at some distance from the corner of the mouth. (Fig. 2.)

More extensive loss of the vermilion portion of the lips cannot be repaired by the above technic. In such cases we have replaced the missing vermilion portion of the lips by the transfer of mucous membrane flaps from the cheek. The wound resulting from the shifting of this flap is easily closed by suturing the elastic mucosa. The new corner of the mouth

is preserved by a mattress suture brought out through the cheek as in the first method, carrying some of the shifted tissue into the depths of the corner. (Fig. 3.)

A more serious type of deformity is caused by the loss of the median section of the lower

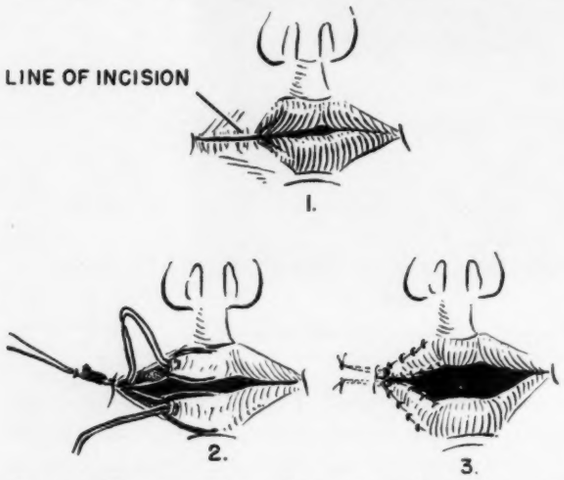

FIG. 2. Diagram illustrating one method of reconstructing the corner of the mouth by advancing full thickness flaps of the vermilion lips.

lip, including the mucous membrane of the lower alveolar process. The extent of the deformity in such cases is dependent upon the amount of tissue loss. One usually sees a reduction in the size of the lip, retracted and adherent to the buccal alveolar process with restriction of normal mobility. (Figs. 4A and B.)

In our opinion, the first important procedure in reconstruction is to release the lip from the alveolar process to allow it to function properly, even though a definite amount of lip tissue is lost. This procedure should be done early, particularly in children, as delay will interfere with the normal growth of the lip. Release of adhesions of the lower lip to the alveolar process may be accomplished either by skin grafting or transferring uninjured mucous membrane from the bordering regions. When scarring is extensive skin grafting by the epithelial inlay technic may be indicated, after excision of the scar tissue. Skin grafts within the mouth, however, have a tendency to contract excessively; it is more advisable to utilize normal mucous membrane from the bordering regions, when feasible. A technic which has given satisfactory results consists essentially of the V-Y procedure. The adherent scars of the buccal sulcus are excised. A transverse incision is made on each side of the wound in the buccal groove toward the molar region, and then extended vertically for a short distance as a relaxing incision. The two rectangular mucosal flaps thus created are brought together and sutured by the V-Y method. Elasticity of the mucosa permits closure of fairly large-sized defects. A raw area, remaining on the alveolar process, may be covered by a split-thickness skin graft at the same time, which also results in a greater depth of the buccal sulcus. This procedure frees the lower lip from the alveolar process and increases its vertical dimensions, but does not add to the horizontal width of the lower lip. (Fig. 5.)

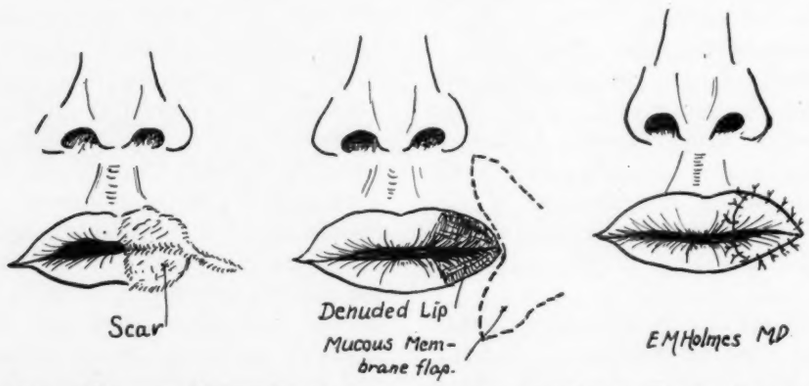

FIG. 3. Diagram illustrating the type of mucous membrane flap used to reepithelize the sides of the lips when the loss of vermilion lip is greater than can be repaired by the method shown in Figure 2.

The loss of a section of the lip complicates further repair of the defect, and the greater the missing part the more difficult reconstruction becomes. However, unless the lip loss is extensive, the mere release of the lip from

4A 4B

FIG. 4. A, photograph at age of two years (seven weeks after electric burn of lower lip). The median section of the lip was destroyed by the burn with subsequent retraction and diminution in all dimensions. B, photograph showing present condition.

adhesions (by the method previously described) should be sufficient until the child assumes his full growth. Case 11 is an example wherein the operative treatment in childhood was limited to freeing the lower lip from the alveolar process. At the age of twelve years (Fig. 4B) only minor corrective procedures were performed.

large full thickness wedge-shaped flaps from the philtral region of the upper lip to fit the defect in the lower lip, the pedicles of these flaps being severed three weeks after the first stage. The principle of this procedure is satisfactory, but the resulting loss of the normal contour of the philtrum of the upper lip is

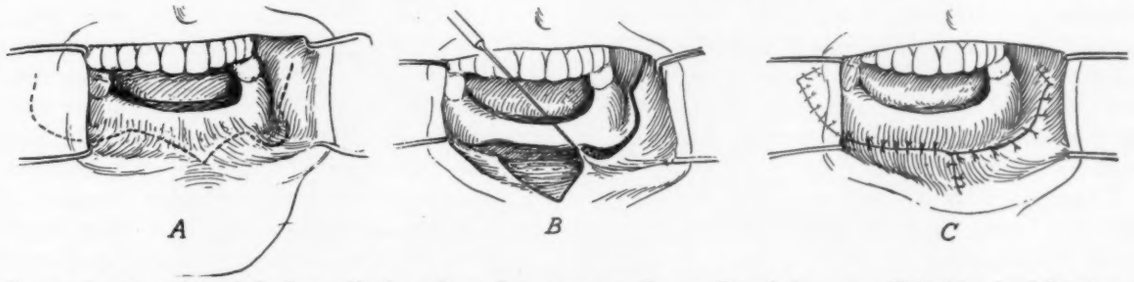

FIG. 5. A, retraction of the lower lip from loss of mucous membrane. Repair is accomplished in the following manner: incision is made along the inner surface of the lip close to the alveolar processes. The scars are excised to allow the lip to assume its normal position. B, the buccal incision is extended toward the molar region where it is carried vertically over the mucous membrane of the cheek, leaving a raw area anteriorly. C, the defect of the inner surface of the lip is covered by mucous membrane, the elasticity of the mucosa permitting this procedure. (From: KAZANJIAN, V. H. and CONVERSE, J. M. The Surgical Treatment of Facial Injuries. Baltimore, 1949. The Williams & Wilkins Co.)

The replacement of missing skin and muscle is a greater problem; and if the loss of tissue is not slight, it should not be attempted until the child is older. This can then be accomplished by borrowing a portion of the upper lip in the form of a "reverse double Abbe-Estlander" operation. Stein described such a procedure in 1848. His operation consisted of rotating two

cosmetically unacceptable by modern standards. A better procedure is to take these flaps from each side of the philtrum, leaving this structure intact, thus yielding a more pleasing cosmetic and functional result. This technic is highly recommended for the repair of all types of deficiency defects of the median section of the lower lip. (Fig. 6.)

The following three cases are presented to demonstrate the results obtained with the use of the reconstructive methods described above.

CASE I. This three and a half year old patient suffered burns about the left side of the mouth when he put an electric plug in his mouth. Examination approximately two years after the accident revealed considerable distortion of the left corner of the mouth, and the upper and lower lips were adherent in that area for a distance of about 15 mm.

The patient was operated on under general anesthesia and the contracted tissue was excised to separate the lips. The indurated scars were also excised. The raw area, mostly due to loss of mucous membrane, was repaired by the use of advancing mucous membrane flaps. (Figs. 1A and B.)

CASE II. This patient was first seen at the age of twenty-one months, approximately seven weeks after an electric burn involving the lower lip. Examination at that time showed that the wound had healed, but it was apparent that there was a loss of a considerable portion of the lower lip. There was a vertical scar over the middle of the lip which was adherent to the alveolar process of the lower jaw. As a result the lower lip was drawn in with a slight notching in the center and the lip was immobile. (Fig. 4A.)

Operation was performed on October 24, 1945, approximately three and a half months after the injury. The lower lip was freed from the alveolar process, resulting in a raw area of the lip, as well as the alveolar process. In order to cover these raw areas thin skin grafts were utilized. The scar at the median part of the lower lip was excised and repaired. The patient was seen periodically for the next few years and then not again until 1954, when she was about ten years old. The contour of the lower lip was within normal limits but it was not as prominent as it should be, and a slight adhesion had formed.

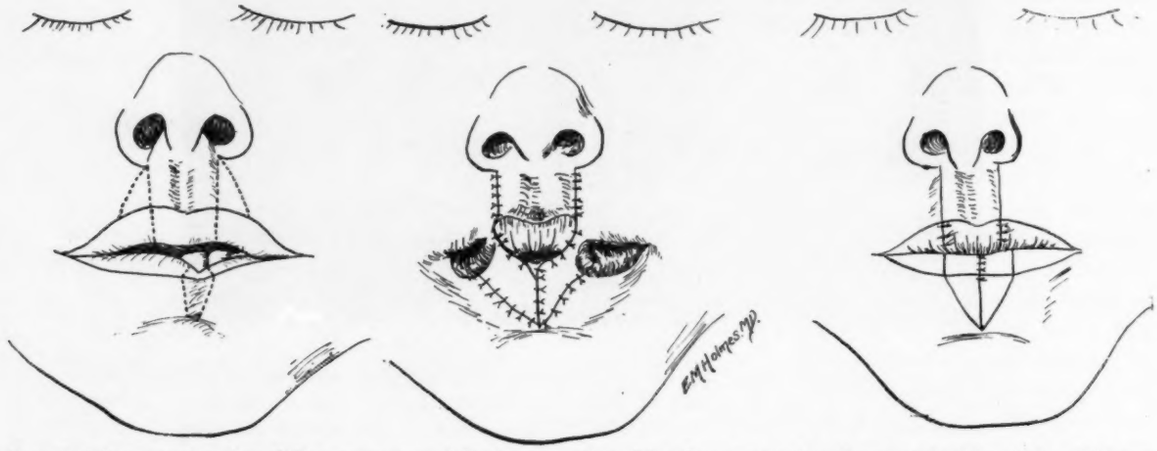

FIG. 6. Diagram showing different stages of Stein operation. The flaps are taken from each side of the philtrum to restore contour of the lower lip.

On February 19, 1954, an operation was performed to release the adhesion of the buccal fold and gain further improvement of the contour of the lip. (Fig. 4B.)

CASE III. This patient was first seen in 1939 at the age of one year. Four weeks previously he had suffered burns about the mouth when he put an electric light plug in his mouth. Examination at that time showed the middle half of the lower lip missing with an area of granulating tissue. The patient drooled constantly. Because the child was uncooperative it was decided to postpone surgery temporarily, and he was not seen again for several years. When the patient returned in 1952 he was almost fifteen years of age and he had not had any surgery to the lips. Examination showed considerable loss of the lower lip, which was smaller than normal and drawn inward. The upper lip was slightly overdeveloped. This condition was the reverse of that seen in cleft palate and harelip cases when the lower lip becomes overdeveloped due to lack of development of the upper lip. (Fig. 7.)

On June 9, 1953, a bilateral Stein procedure was carried out with the patient under local anesthesia. The contracted scar which was limiting the motion of the lower lip was excised

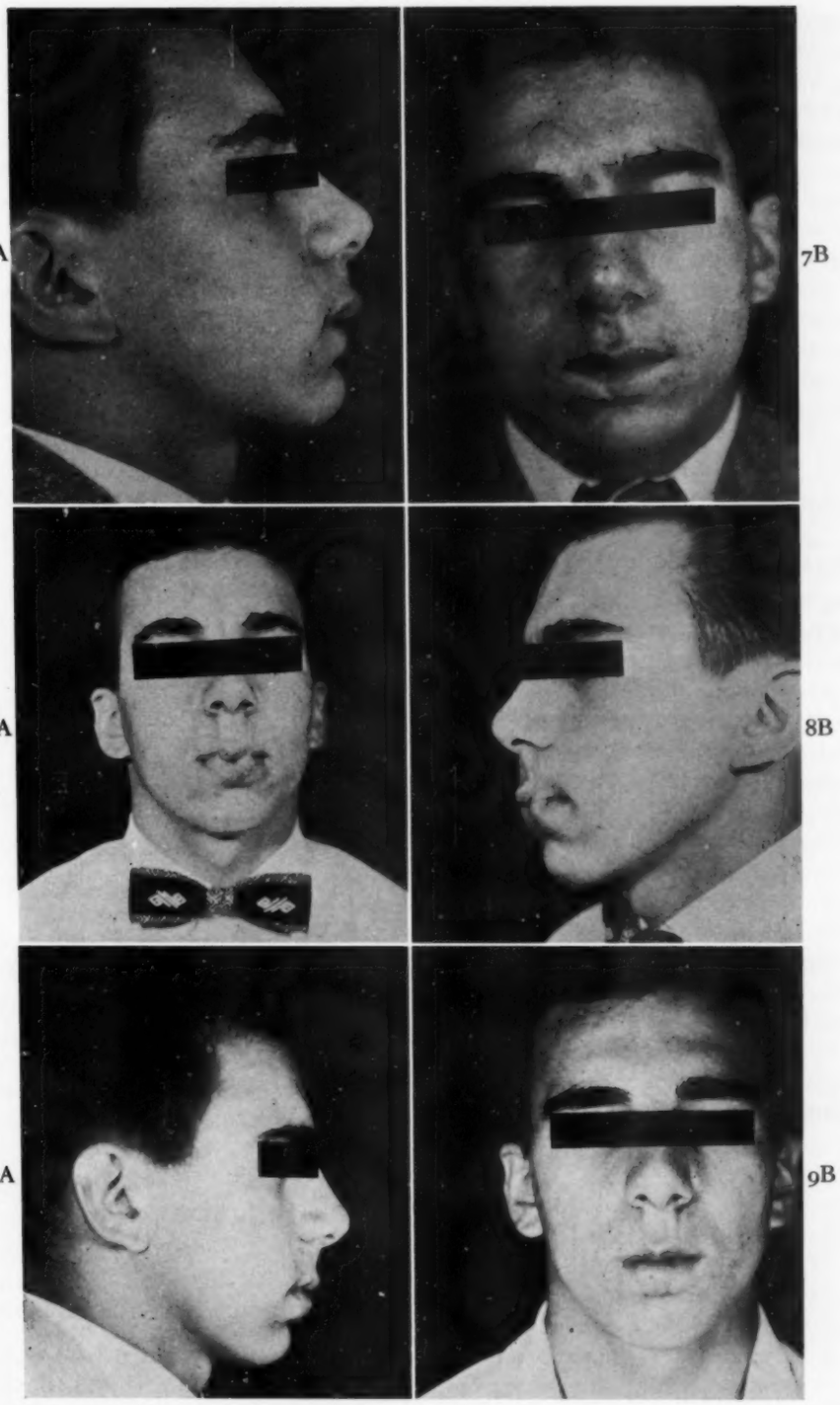

FIG. 7. Photographs showing retracted lower lip resulting from electric burn in infancy.

FIG. 8. Photographs prior to second stage operation showing the pedicle on each side of the philtrum.

FIG. 9. Photographs showing present condition. Note fullness of lower lip. There is no disturbance of contour of the upper lip.

vertically, leaving a V-shaped wound in the lip. To repair this, a V-shaped flap was taken from the upper lip, just to the right of the philtrum, and this represented one-half of the tissue needed to repair the wound of the lower lip. The flap was rotated downward and mucous membrane was sutured to mucous membrane and skin to skin. The same procedure was then carried out on the left side of the philtrum thus transferring the amount of tissue needed to repair the lower lip. (Fig. 8.)

On July 3, 1953, the second stage was performed; the pedicles of both flaps were severed and the resulting wounds trimmed and sutured to approximate the vermilion borders. A minor procedure was carried out in September to eliminate an unnatural fullness of the lower lip. (Fig. 9.)

SUMMARY AND CONCLUSIONS

A brief review of the unusual features of electric burns of the lips is presented, including electro-physical aspects, pathology and resulting deformities. Several operative procedures for the repair of these deformities are presented in detail and three cases are included, demonstrating the results obtained with such reparative technics.

Two principal types of deformity have been encountered in our experience. One is the destruction of the corner of the mouth with adhesion of the lips in this region and the other is the loss of the median portion of the lower lip with adhesion to the alveolar process. The repair of these two types has been found to be satisfactory by the methods described in the text. The modification of the Stein operation is highly recommended to reconstruct the median portion of the lower lip, after full development of the upper and lower lips. Prior to this, however, it is recommended that only such procedures be performed which will free the lower lip from the alveolar process by the use of rectangular mucous membrane flaps from each side of the adhesion.

The repair of the corner of the mouth may be satisfactorily accomplished by advancing flaps from the vermilion portion of the lips in certain cases; in other cases repair involves the utilization of mucous membrane flaps from the inner surface of the lips and cheek. It must be emphasized that in such procedures carried out in young patients, it is imperative to sacrifice as little normal tissue as possible, since this may represent a considerable amount of tissue after full growth.

A plea is made to advise the public that this type of accident is not too uncommon, and that safer types of appliances should be used in the home. Housewives should be cautioned against carelessly leaving live electric cords on the floor where they may be reached by children. The home owner should be made aware of the fact that safer types of electrical outlets are available for installation in the home.

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Thyroiditis

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THYROIDITIS is in reality a group of three distinct diseases affecting the thyroid gland. In 1896 Riedel described a sclerosing type of disease which is known as Riedel's struma. In 1912 Hashimoto reported four cases and gave his description of another disease, now known as Hashimoto's disease. The third disease is a granulomatous acute or subacute infection known by various names such as pseudotuberculous thyroiditis or pseudo-giant cell thyroiditis of deQuervain.

There is no evidence that these three diseases are various stages of the same disease. Crile has followed several cases of Hashimoto's disease taking biopsies with the Vim-Silverman needle at intervals for as long as twelve years and finds that the microscopic character of the disease has remained the same all of the time.

The authors have reviewed eighty cases seen in the past thirty years. Of these, fifty-six fall into the classification of acute and subacute thyroiditis. Twenty are examples of Hashimoto's disease, and four cases of the rarer Riedel's struma were seen.

Each one of these entities will be described separately.

ACUTE AND SUBACUTE THYROIDITIS

This group can be further subdivided into acute suppurative thyroiditis which is rare and acute or subacute granulomatous thyroiditis.

Acute suppurative thyroiditis is a disease which was seen more frequently two decades ago than recently. This is probably due to the widespread use of antibiotics and chemotherapy. The disease is more common in children and young adults and is more likely to occur in a goitrous gland than in a normal gland. The offending organisms are usually staphylococcus, streptococcus, Escherichia coli or Bacterium typhosum.

The onset is usually acute with high temperature and pain in the neck referred to the ear or the back of the head on the side involved. The gland is swollen. The patient holds his neck flexed with the head rotated to the affected side. Attempts to extend the neck cause pain. Dysphagia is also present. Areas of softening may be felt, but this is not usually the case because of the intervening fascia and strap muscles and the tough capsule of the gland. The pus in the gland usually burrows out to the skin, but it may rupture into the trachea or esophagus or burrow into the mediastinum, causing a mediastinal abscess.

The diagnosis is difficult. Swallowing is usually painful and is associated with movement of the inflammatory mass. Abscess formation can be demonstrated by aspiration with a needle.

The treatment of this condition is incision and drainage of the abscess and liberal use of antibiotics. No attempt should be made to resect the gland at the original surgery. Altemeier states that conservative treatment is the best if successful. Wounds from surgical drainage heal slowly.

Of the authors' seven cases all but one occurred before 1940. That one case was in a fifty-three year old woman who had had a pre-existing nodular goiter for twenty-five years. She was treated by lobectomy which disclosed acute infection of a degenerating adenoma. The remainder of the cases occurred in patients from five years to seventy-nine years of age. One patient had only miliary abscesses in the gland. Frank pus was present in the others. All were treated by incision and drainage, and all recovered.

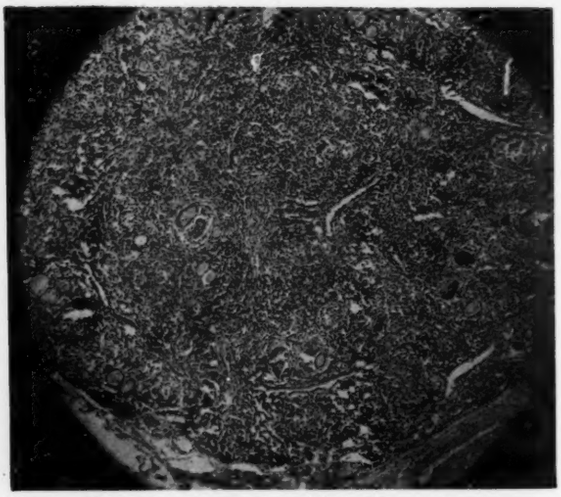

FIG. 1. Granulomatous thyroiditis. Note almost complete obliteration of normal architecture of thyroid gland with diffuse infiltration of lymphocytes. A number of giant cells associated with free colloid are present, particularly on left side of field. Fibrosis in this section is not marked.

Acute and chronic non-suppurative thyroiditis (Fig. 1) is a more common disease and is seen quite frequently in spite of antibiotics. It is known by various names, such as deQuervain's disease or pseudotuberculous thyroiditis.

Early in this disease the microscopic picture shows a moderate degree of fibrosis, with many polymorphonuclear neutrophils. The acini show degeneration and spillage of colloid with foreign body giant cells present. In the more chronic phase of this same picture the polymorphonuclears have disappeared, and numerous foreign body giant cells, lymphocytes and plasma cells are present. The last phase of this picture is one of healing, in which giant cells and inflammatory cells have practically disappeared, considerable epithelium has been destroyed and a great deal of fibrosis is present. The giant cell seen in these glands is not a true tubercle. It represents a cellular response to colloid which has been spilled outside of degenerating acini and which is being phagocytized by the giant cell. No caseation is present. Neither tubercle bacilli nor any other bacteria have ever been demonstrated in these giant cells.

Clinically the disease follows two definite courses, but histologically the picture is the same. There is (1) the acute fulminating type with fever, pain, severe tenderness and systemic symptoms, and (2) the chronic type with slight fever, mild pain and tenderness, and insignificant systemic symptoms. Between these two extremes are cases which present symptoms belonging to both types.

Subacute thyroiditis usually occurs in women between the ages of thirty and fifty. It frequently follows an acute upper respiratory infection. There is usually sore throat, pain on swallowing and pain in the region of the gland which radiates behind the ear on the affected side. The patient complains of fatigue, weakness and malaise. Temperature varies from normal to 104°F. in the acute stage, and a low grade fever may be present for many months in the more chronic phase. There is usually moderate weight loss, and some patients will have symptoms of mild hyperthyroidism such as tachycardia, sweating and tremor. The thyroid gland is diffusely enlarged, tender and hard. Enlargement is usually bilateral but it may occur in one lobe or in the isthmus. The use of the Vim-Silverman needle to establish a definite diagnosis has been recommended by some workers. In these cases the process is a simple office procedure and is of value in differentiating subacute thyroiditis from Hashimoto's disease. The sedimentation rate in these cases is greatly increased and at times may be up to 120 mm. in one hour. Radioactive iodine uptake is low (5 per cent compared to 30 to 50 per cent for a normal gland). The basal metabolic rate is usually within normal limits. One feature of the disease is that usually one entire lobe is involved in the process so that it retains its shape. This is important in differentiating it from an adenoma or a carcinoma in which the gland is nodular.

The cause of the disease is not known but it probably represents a virus infection in which there is damage to the cells lining the follicles. One of the cases in this report was of a young man with acute thyroiditis with a concomitant virus pneumonia.

Many types of treatment have been proposed by various men. The disease definitely does not respond to antibiotics. Fraser and Harrison recommended the use of methylthiouracil, 600 mg. daily. They obtained excellent results in three cases, but this view is not shared by most workers. Crile advocates the use of x-ray therapy in doses of 600 to 800 r given daily in doses of 100 to 150 r. He states that the response is usually dramatic and many patients were relieved of their symptoms after the first or second treatment. Recovery in

FIG. 2. Hashimoto's disease. Lymphoid hyperplasia involving lobule. Thyroid acini are small and lined by large, pale-staining acidophilic cells. Note secondary centers of the lymphoid follicles.

most cases is complete in three weeks. Radioactive iodine, however, is of no value.

Thyroidectomy with subtotal removal of both lobes gives satisfactory results in most cases and has the added advantage that an accurate diagnosis can be made in each case thus definitely excluding carcinoma of the thyroid. Surgery has been the treatment of choice in thirty-seven cases in this report with uniformly good results.

In the past year ACTH or cortisone has been used and shows considerable promise. Lasser reported a case of a thirty-three year old woman with symptoms of thyroiditis for one month. The patient was given cortisone acetate, 100 mg. daily, with complete subsidence of symptoms in four days. The patient was kept on a maintenance dose of 50 mg. daily until the sedimentation rate had returned to normal. Cortisone was then discontinued after twenty-five days of treatment, and there was no recrudescence of symptoms.

In the forty-nine cases reported herein forty-three were in women and six in men. The ages of these patients fell between thirty and sixty, with three exceptions in which the ages were sixty-three, nineteen and seven. Fourteen patients were treated conservatively. Conservative measures varied over the years and included iodine by mouth, ultraviolet blood irradiation, x-ray therapy, penicillin, aureomycin, hot application, watchful waiting and cortisone. All of these patients showed improvement either in spite of the treatment or because of the treatment. This last pessimistic remark does not apply to the use of cortisone, which has been tried with excellent success in two cases.

Subtotal thyroidectomy was carried out in thirty-five of these cases. These patients all had had their ailment for a longer period of time, and conservative treatment had been tried and had failed in many of the cases. Results were uniformly good and no complications were noted.

HASHIMOTO'S DISEASE

The second form of thyroiditis was described by Hashimoto in 1912 and is known as Hashimoto's disease or struma lymphomatosa. (Fig. 2.) It is seen almost entirely in women near the menopause. This incidence suggests that endocrine imbalance may be a factor in the etiology. It is doubtful if Hashimoto's disease is a true infection of the thyroid gland at all. Perhaps it should not be included in this paper. It may only be a manifestation of the thyroid gland to systemic endocrine imbalance. Clinically the disease is frequently mistaken for carcinoma of the thyroid.

Histologically there is atrophy of thyroid tissue and the acidophilia of epithelium, with

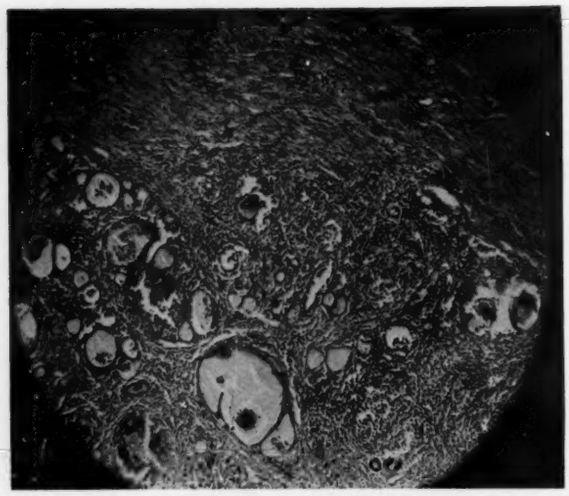

FIG. 3. Giant cell variant of Riedel's struma. Note distortion of thyroid lobules by an increase of fibrous tissue (upper third of field). Remainder of section shows a diffuse infiltration by small lymphocytes. Note giant cells in region of ruptured glands and free colloid.

marked infiltration of the gland and with lymphoid tissue at times forming germinal centers.

The gland is uniformly involved, enlarged and of a rubbery consistency. On cut section the gland is salmon pink in color and not adherent to surrounding structures.

The disease develops gradually, and most patients give a history of enlargement of the thyroid gland for many years, a sore throat, dysphagia and nervousness. There is no fever or systemic reaction. Hoarseness is quite a prominent symptom but there is usually no complaint of tracheal obstruction. Most of the patients seen had had symptoms for a year or less. The gland itself usually is bilaterally, diffusely enlarged. It is non-tender, hard and frequently mistaken for carcinoma. Many of these patients are hypothyroid before surgery, and most develop hypothyroidism after surgery and must be given dessicated thyroid gland.

The diagnosis is usually made at the operating table. The treatment of choice is conservative subtotal thyroidectomy.

Twenty cases of Hashimoto's disease are included in this report. All occurred in women between the ages of thirty and sixty, except two patients who were twenty-six and one who was twenty-seven years of age. The preoperative diagnosis in most of these cases was nontoxic adenoma. Subtotal thyroidectomy was carried out in all of these patients with uniformly good results.

RIEDEL'S STRUMA

The third type of thyroiditis was described by Riedel in 1896 and has since been known as Riedel's struma. (Fig. 3.) This is a chronic fibrosing disease involving the thyroid gland and its surrounding structures. It forms a tumor which is easily mistaken for carcinoma of the thyroid. Its cause is unknown but it is not the end result of either subacute thyroiditis or Hashimoto's disease.

It is most common in women over the age of fifty. The onset is painless and insidious, and the tumor grows slowly over a period of years. The chief complaint is tracheal obstruction, which can be shown by x-ray of the trachea. There are few systemic symptoms. The tumor is usually unilateral and stony hard, being frequently diagnosed as carcinoma of the thyroid. However, carcinoma usually presents a nodular appearance.

Pathologically the gland is stony hard and avascular. It is intimately adherent to the prethyroid muscles, trachea, recurrent laryngeal nerves, carotid sheath and any other adjacent structures, although it is not attached to the skin. An adenoma or remnant of a degenerating adenoma is usually found in the center of this fibrous mass. Microscopically there is a chronic inflammatory mass with replacement of the thyroid tissue by fibrous tissue.

Surgery is indicated in this condition for the relief of the tracheal compression and obstruction. Removal of the involved portion of the gland is frequently impossible because of its intimate adherence to all structures which would certainly insure damage to the carotid sheath, trachea or recurrent laryngeal nerves. If only one lobe is involved, removal of the lobe and the isthmus is usually possible. However, if the entire gland is involved, removal of the isthmus is usually all that is possible. Some men have advocated splitting the involved lobe in unilateral involvement and removing the degenerating adenoma which forms a core. After this procedure the pressure symptoms are relieved and the tumor begins to regress. This method may be of value in dealing with those cases associated with retrotracheal adenomas which compress the trachea from behind. This type causes the most serious

tracheal obstruction. X-ray therapy has been tried without any significant results.

Four cases of Riedel's struma are included in this report. All of these cases were in women over the age of forty years. Thyroidectomy was performed in all cases with uniformly good results. At this Clinic, where the technic of thyroidectomy includes the use of the cautery loop, it has been possible to shell out the interior of the gland by using the cutting loop to shave off small pieces of gland without destroying any vital structures. This method has allowed us to remove lobes of the thyroid which would be impossible to dissect by the use of scalpel or scissors in the conventional manner.

SUMMARY

A review of the literature of thyroiditis is presented along with a discussion of three types of thyroiditis with their symptoms, histologic signs and treatment. The authors' experiences in treating eighty cases of thyroiditis in the past thirty years are presented.

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Infarction of the Small Intestine Sequent to Polyarteritis Nodosa of the Mesenteric Vessels

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POLYARTERITIS nodosa has been generally accepted as a definite clinical and pathologic entity presenting consistent cytologic features regardless of the site of development of the lesion. The clinical expression of this condition as it affects the mesenteric vessels is typified by a disturbed function of the gastrointestinal tract as shown by the persistent abdominal pain, malaise, anorexia, loss of weight and weakness. The condition is by no means common but it is not of such rarity that any surgeon who deals regularly with abdominal emergencies can afford to ignore its existence. The purpose of this paper is to draw attention to this morbid condition which although not often seen in the average surgical practice stands out as a threat to all who enter the peritoneal cavity expecting to find disease in this location.

CASE REPORTS

CASE 1. B. D., a twenty-three year old woman, was admitted to the Doctors Hospital complaining of severe abdominal pain, vomiting and diarrhea. The patient first became ill twelve months before admission to the hospital. At that time, when in her second month of pregnancy, she received an injury to her abdomen caused by someone falling against her. Following this she complained of repeated attacks of pain in the abdomen which were frequently accompanied by vomiting and diarrhea. The attacks occurred once or twice a month and lasted several days. Her pregnancy continued normally, however, and she gave birth at term to a normal infant. Although her appetite had been good, she had lost about 23 pounds since the onset of her illness. During the three weeks before admission the abdominal pains had become almost continuous and very severe in character. She had also been running a fever which fluctuated between 99° and 101°F. A short time following the onset of her severe abdominal pains she noted a skin rash over her arms and legs; this later spread to involve the trunk as well and was described as being itchy.

At the age of five she suffered an attack of acute rheumatic fever. Since then she had had several attacks of red, swollen and painful joints which forced her to remain in bed for several weeks at a time.

On admission to the hospital the patient appeared markedly undernourished and dehydrated. She was well oriented, cooperative and complained of severe and generalized abdominal pain. The temperature was 99.8°F., pulse 98 and respirations 24. The skin was covered by a rash which consisted of pale nodules set upon a red base. The nodules varied in size from 3 to 30 mm. in diameter and were chiefly oval in shape although some presented pseudopod-like excrescences.

The mouth was edentulous. The thyroid was not palpably enlarged; the lungs were clear to percussion and auscultation. The heart sounds were somewhat distant but regular; there were no murmurs. Blood pressure was 110/70.

The abdomen was moderately distended, firm but not rigid; it was exquisitely tender in both lower quadrants. Marked rebound pain was also present. The liver and spleen were not palpable. All joints were freely movable; none were tender, hot or swollen.

The laboratory findings were as follows: Hemoglobin was 80 per cent; red blood cells 4,450,000; white blood cells 2,150 with 5 per cent stab forms, 67 per cent polymorphonuclear

neutrophils, 2 per cent eosinophils, 24 per cent lymphocytes and 2 per cent monocytes. Urinalysis was essentially negative.

Gastrointestinal series revealed the following: The duodenal cap was smooth in contour. The proximal half of the second portion of the duodenum was irregular and irritated. Spot films of this area demonstrated a fair deposit of barium. The findings suggested a postbulbar ulcer. The remainder of the duodenum and small intestine was not remarkable. Barium enema showed a normal flow of barium without obstruction from rectum to cecum, spilling into the terminal ileum which appeared quite within normal limits.

Agglutination tests for typhoid, paratyphoid, Brucella abortus and melitensis proved negative. Stool cultures were also negative. The electrocardiogram was within normal limits.

The clinical impression was that of polyarteritis of the mesenteric and cutaneous vessels. The diagnosis was confirmed by a biopsy examination of one of the skin nodules. At first the patient was treated conservatively, treatment being mostly supportive and palliative. When she failed to improve, however, and the abdominal pains continued with increasing severity, it was decided to perform an exploratory laparotomy.

At operation, performed on the seventeenth hospital day, the abdominal cavity was opened through a right mid-rectus incision and the peritoneal cavity was explored. Several individual loops of gangrenous bowel measuring from 8 to 20 inches in length were found irregularly spaced along the small intestine. One such loop of necrotic bowel measuring 18 inches in length had sloughed away completely and was lying loose in the peritoneal cavity. Surprisingly, there was very little peritoneal reaction in spite of the free escape of intestinal contents through the open ends of the bowel.

The infarcted intestine was resected and the severed ends of the bowel were exteriorized as a double-barrel ileostomy. Two Penrose drains were inserted in the peritoneal cavity for drainage and the abdominal wound was closed in layers.

Following the operation the pain became less marked. The patient's temperature fluctuated between 98° and 99.5°F. Her appetite was still very poor and at intervals she vomited small amounts of fluid.

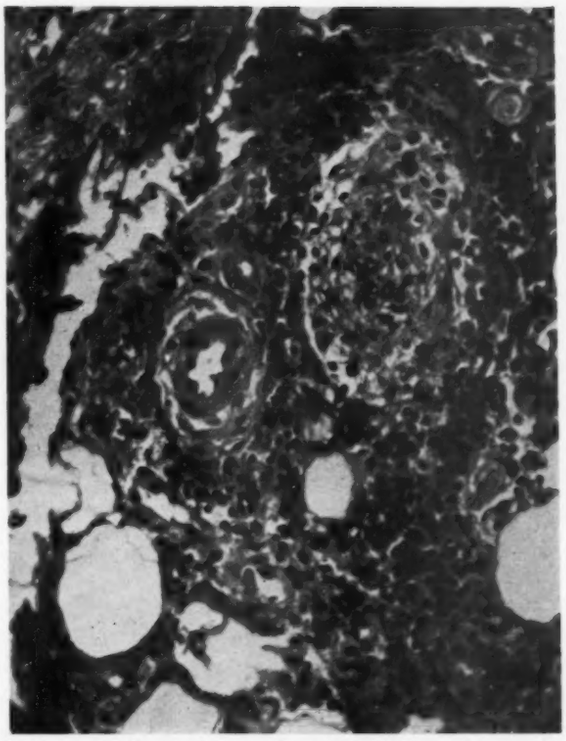

FIG. 1. Polyarteritis nodosa involving the small arterioles in the mesentery. Note the dense cellular infiltration in and around the vessels and the necrosis of the wall. × 400.

On the fifth postoperative day the terminal phalanges of the first, second and third toes became cold, blue and painful. A few days later the toes became gangrenous and the pain diminished. The skin rash began to fade away and left behind multiple small foci of necrosis. The general health of the patient continued to deteriorate and she died on the twenty-sixth postoperative day.

Gross examination of the specimen removed at operation showed several necrotic loops of small intestine. Microscopically, the various coats of the bowel wall were poorly delineated and in many instances only ghosts of preexisting tissue structures could be recognized. The main interest, however, centered around the blood vessels. The smaller sized arteries and veins showed an acute inflammatory process similar in appearance to that commonly seen in polyarteritis nodosa. The inflammatory cell exudate was composed largely of polymorphonuclear neutrophils in and about the small and medium-sized arteries and veins. In addition, necrosis of the vessel wall, intimal proliferation and thrombosis of the lumen were found. (Fig. 1.)

FIG. 2. Polyarteritis nodosa involving a small mesenteric vein. There is an acute inflammatory cell reaction in and around the wall of the blood vessel. × 180.

CASE II. F. H., a thirty-one year old white woman, first consulted us because of severe abdominal pain of three days' duration. She stated that she had been in good health until several weeks previously when she began to tire easily, lost her appetite and developed intermittent attacks of sharp abdominal pain. Three days before entering the hospital she was seized with an excruciating attack of abdominal pain which became more persistent and was accompanied by nausea and vomiting.

On examination the patient was fairly well nourished but pale. Her temperature was 100.8°F., pulse 96 and respirations 22. The heart and lungs were essentially normal; the blood pressure was 115/80. The abdomen was a little distended but very tender throughout, especially around the mid-abdomen. There was very little release pain or rigidity. Rectal examination was negative. The blood count showed a leukocytosis of 11,500 with 5 per cent eosinophils.

Several small cutaneous nodules ranging in size from 3 to 8 mm. in diameter were found irregularly distributed over both legs; they caused no pain or itchiness.

A tentative diagnosis of polyarteritis nodosa involving the mesenteric and cutaneous vessels was made. This was later substantiated by a biopsy examination of one of the skin nodules. At operation about 20 inches of ileum were found necrotic and of a dark purple color. The remainder of the bowel appeared quite normal.

The entire segment of necrotic intestine was resected including several inches of adjoining normal bowel. Continuity of the intestine was restored through a side-to-side anastomosis of the opposed ends of severed bowel. The patient made a satisfactory recovery and was discharged from the hospital eight days later.

Grossly, the resected ileum was the seat of an infarct measuring 20 inches in length. Microscopically, the striking changes were seen in the blood vessels. These changes were characteristic of polyarteritis nodosa and were seen in various stages of inflammation, from the acute to the completely healed. In some the walls were necrotic and densely infiltrated with polymorphonuclear neutrophils and eosinophils, while others showed less of the cellular infiltration and more of the necrotic and fibrinoid degeneration. Some of the lumens were occluded by relatively recent thrombi, while others showed long-standing thrombosis with partial or complete organization and recanalization. (Fig. 2.)

EVALUATION

These two cases illustrate the atypical symptomatology of this disease. In both, the main symptom was that of abdominal pain which extended over a period of a year in one patient and for several weeks in the other. Both patients had lost considerable weight, and in one the repeated vomiting and anorexia resulted in a dangerous degree of dehydration and cachexia. In the latter case, also, a diagnosis was not made sufficiently early to enable a planned operation to be undertaken with an assurable chance of success. Consideration of these two cases raises for discussion several points of interest.

Anatomy. The old name of "polyarteritis nodosa" given to the condition under discussion reflects the view that only the arteries are affected in the disease process. However, it is now universally accepted that both the arteries

and the veins may be attacked, and all vessels in the body may be involved simultaneously or successively. The histopathologic changes noted in and about the blood vessels are rather unique and quite striking, and therefore offer little difficulty in anatomic diagnosis. The inflammatory process is rapidly progressive and pursues a definite pattern. In the early stages of the disease there is an acute inflammatory cell exudate composed largely of polymorphonuclear neutrophils, eosinophils and lymphocytes in and about the small- and medium-sized blood vessels, and necrosis of the media. The intima at the same time shows endothelial proliferation with encroachment on the lumen. As the disease progresses, necrosis of the vessel wall and thrombosis of the lumen follow in rapid succession. The end result of this inflammatory process is gradual replacement of the cellular exudate by infiltrating fibroblasts; this results in fibrosis and obliteration of the vessel. Sometimes organization and recanalization of the thrombus will occur. We could demonstrate in our specimens all morphologic gradations from the early infiltrative cellular tendencies, through endothelial proliferation of the intima, necrosis of the vessel wall and thrombosis, up to frank and unquestioned fibrous replacement of the vessel. The necrosis of the media is of a fibrinoid nature closely resembling the picture seen in Libman-Sacks disease, malignant nephrosclerosis and rheumatic fever. Some observers are inclined to associate polyarteritis nodosa with these lesions although we do not subscribe to such a concept.

A review of the surgical literature bearing on the subject gives the impression that polyarteritis nodosa involving the mesenteric vessels is a rare occurrence. This point is emphasized here in order to suggest the possibility that the condition is probably more common than the literature would suggest, and that owing to late diagnosis or to lack of appreciation of the seriousness of this condition many of these patients die without an accurate diagnosis having been established.

The mesenteric vessels are the site of maximum incidence, with the majority of lesions grouped around the vessels nourishing the small intestine. It is difficult to ascribe any significance to this except to note that it does occur. Wold and Baggenstoss[1] have shown that any portion of the gastrointestinal tract may be involved. Johnson and Baggenstoss,[2] in a study of sixty cases of arterial occlusion and twelve cases of both arterial and venous occlusion, observed three cases involving the mesenteric arteries. In one of these the entire jejunum and ileum were the sites of infarction, while in the other two cases numerous small areas of the intestine showed evidence of infarction which gave the appearance of mucosal ulcers. Diaz-Rivera and Miller[3] have stated that peptic ulcer with hematemesis and perforation was relatively a frequent complication of polyarteritis nodosa and that surgery based on mistaken diagnosis was not uncommon.

The pathologic characteristics of polyarteritis nodosa have been well described but a few points might be emphasized to advantage, especially as it concerns the gastrointestinal tract. The intestinal lesions vary from solitary, minute, isolated foci of necrosis to confluent and massive ulceration. Acute involvement of the stomach or bowel wall may lead to perforation and fatal peritonitis. The submucous and muscular coats are affected initially but later erosion and ulceration of the overlying mucosa secondary to ischemic changes may lead to the finding of occult blood in the stools and even to bloody diarrhea. Felsen[4] has stated that a diagnosis of polyarteritis may sometimes be made by sigmoidoscopy in instances in which the large bowel is affected.

All investigators agree that the infarction of tissues follows strictly in the path of, and is confined to, the occluded vascular area. In each of our cases the site of infarction in the bowel in relation to the mesenteric vessels was definite. In the first patient the mesenteric vessels were widely affected, and consequently the necrosis of the bowel was also extensive. It is also of interest to note in this connection the finding of skipped areas where segments of necrotic bowel alternated with healthy looking intestine and presented a picture somewhat similar in appearance to that seen in regional ileitis, although the pathologic process in each instance is quite different. Skipped areas occur as a result of the irregular distribution of the lesion along the mesenteric vessels; segments of bowel whose vascular supply becomes occluded will undergo necrosis while other segments whose blood supply is not affected by the disease process will remain healthy.

Etiology. In spite of a tremendous volume of clinical investigation and experimental work there is still no really clear and undisputed

picture of the natural history and evolution of polyarteritis nodosa or the part played by any agent or group of agents in producing this condition. The thesis, first put forward by Gruber[5] in 1925 and later developed by Rich[6] and others, that the disease might be the result of hypersensitivity is an attractive one and does provide a working hypothesis on which a rational line of treatment may be built up. The evidence for it, however, is not conclusive and it cannot yet be regarded as well proved. It is a factor, though, which should not be ignored in the investigation of this disease. It must be admitted that the whole subject of etiology of this condition is still debatable. To us, this is not a specific lesion for which any one cause can be invoked.

Symptoms and Diagnosis. There are no pathognomonic signs and symptoms of polyarteritis nodosa of the mesenteric vessels. In the earlier stages of the disease the digestive disturbances do not seem to fit into a definite type. Most commonly the patient complains of malaise, anorexia, loss of weight, weakness and general abdominal pain of a vague nature. In reviewing our two cases it is seen that both patients had suffered from digestive disturbances for many months. In both the symptoms had become severe for at least several weeks. During that length of time one of them had become profoundly dehydrated and cachectic.

Physical examination of a patient with polyarteritis of the mesenteric vessels is unlikely to provide any direct evidence as to the exact cause of the symptoms. The general condition of the patient varies with the extent and rapidity with which the disease develops. Thus a patient who shows minimal involvement of the blood vessels, and consequently also minimal disturbances in the bowel, has few symptoms and is in relatively good health. At the other extreme is a patient who presents clinical features of widespread gangrene of the bowel and is in profound shock, as in our first case. In the intermediate group are patients in whom the symptomatic effects of the vascular and intestinal disturbances are not severe, but these patients have latent manifestations of the disease which can be detected only by careful search or by special clinical investigation. The assessment of a patient may be misleading if this is not remembered; if looked for, however, the lesion could scarcely be missed. The gravity of the condition as judged both subjectively and objectively is directly related to the severity and duration of the disease.

In one patient the nature of the disease was discovered relatively early; this allowed early institution of treatment and the patient is still alive. In the other patient the cause of illness was discovered only after many months of suffering. This patient was admitted too late in the course of her illness for adequate investigation to be undertaken, and too late for help from surgery. The two cases are thus meant to show that no patient with severe, persistent gastrointestinal trouble which after careful clinical examination resists dietetic and medicinal treatment should be allowed to continue without examination by a doctor alert to the less common lesions of the alimentary tract.

Certain features of this disease, such as the appearance of a skin rash and the tendency for this to spread, permit of possible early recognition of the condition; a biopsy of the skin lesion will clarify the diagnosis in many instances. Unfortunately, only a small group of patients with polyarteritis nodosa display the skin lesion, and one has to search for the lesion in a biopsy of muscle whenever the disease is suspected. In the present series both patients had the characteristic skin nodules of polyarteritis nodosa; a biopsy of one of these nodules disclosed at once the true nature of the disease.

The changes in the peripheral blood vessels are sometimes associated with local gangrene, as was the case in one patient. The findings noted in the peripheral blood vessels are of considerable diagnostic significance. The joints may also become affected, become swollen, tender and red, as was seen in one patient.

The laboratory data are of no particular aid in making a diagnosis. The blood cell count may or may not show leukocytosis or an increase in eosinophils. Our first patient showed leukopenia and a normal eosinophilic count while the second patient showed leukocytosis of 11,500 and 5 per cent eosinophilia.

Treatment. Surgeons want to know, from experience gained from proved results, what the most effective treatment is for a given condition. Owing to the difficulty in early diagnosis in this obscure type of lesion very few patients have been known to survive

operation. Diagnosis is invariably late as it is dependent on the onset of symptoms, and it is well recognized that unfortunately the early symptoms of this disease are vague and apt to be confused with those of other intra-abdominal lesions. By the time the patient sees the surgeon, the disease has reached the terminal stages.

The main surgical problem is in the management of the infarcted bowel; to prevent its occurrence if it has not already happened and to deal with it in the most effective manner once it has taken place. Operation at the earliest opportunity is essential not only because it is often virtually impossible clinically to differentiate infarction of the bowel from other acute intra-abdominal lesions, but also because it is the only means by which the presence of infarction or perforation of the bowel can be determined.

From the point of view of treatment it is useful to consider separately several stages in the pathologic process of the disease:

Stage 1: Necrosis or perforation of the bowel has not occurred and does not seem likely. In such cases the abdomen is closed with or without drainage.

Stage 2: Necrosis or perforation of the bowel has not occurred but seems to be imminent. A number of possible courses are open. The entire necrotic loop may be excised and continuity of the bowel re-established, preferably through a side-to-side anastomosis. The infarcted area if relatively small may be oversewn or invaginated.

Stage 3: Infarction and perforation of the bowel have occurred. Exteriorization of the affected segment of bowel may be done, opening it as an ileostomy on the following day; or the necrotic loop is resected and continuity of the bowel restored through anastomosis of the severed ends of the bowel. It is not always possible to assess the effect of adequate initial treatment. So often, indeed, the lesion appears clinically and anatomically local. Therefore treatment is local excision of the necrotic bowel, and often, judged by ideal standards, the local excision has been inadequate. Nevertheless a good many patients survive for many years with such surgical procedures. The methods of accomplishing this are scarcely standardized yet and perhaps should not be, each surgeon who meets with the problem dealing with it as seems to him best. As a general rule, the simplest procedure that seems to be adequate should be employed. Provided that the state of the patient is not such that any avoidable prolongation of the operative time is inadmissible, the infarcted bowel should be removed as time does not seem to increase the risk.

The last chapter in the treatment of polyarteritis nodosa has not been written as yet. We believe that a well planned bacteriologic, pathologic and allergic study of a large mass of material will be more likely to provide the ultimate solution to the problem of this vascular disease. The final cure is more likely to come from such studies than from the surgeon's knife. Until more is known about the various factors which stimulate formation of the lesion, no definite progress can be made in combating this disease.

SUMMARY

Two cases of polyarteritis nodosa involving the mesenteric vessels with extensive necrosis of the bowel are reported and fully discussed. The etiology, pathology, symptomatology and surgical management of this condition are reviewed.

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Practical Factors in Gastric Resection

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THE attainment of successful operative results with a minimal incidence of complications is a common surgical goal. The operative procedure of partial gastric resection is usually accompanied with low morbidity and mortality rates[6,7,10,11,15] when competently performed by well standardized methods. The occurrence of any serious or unusual complications, however, may promptly adversely affect these rates. Gastric resection entails considerable operative interference in the upper abdomen where complications seem prone to be serious. Practical factors of a general and technical nature are important in curtailing complications and obtaining successful results in gastric surgery.

Although the routine treatment of peptic ulcer is primarily a medical problem, the occurrence of acute and chronic disabling affects often requires surgical intervention. Acute perforation or severe hemorrhage pose special emergency problems. Chronic conditions that often necessitate elective surgical treatment are: (1) pyloric or duodenal obstruction, (2) recurring bleeding episodes, (3) resistant stomal and gastric ulcers and (4) intractability. Intractability, although a frequent indication, is the most difficult to define. It involves an appraisal of ulcer severity and duration of symptoms, age of the patient, treatment response, personality traits, personal habits and desires, ulcer complications, coexisting diseases, treatment facilities and the site, character and change of the lesion.

Careful evaluation and selection of cases, proper pre- and postoperative care, and the utilization of sound surgical methods and technic all aid in minimizing complications. Adequate preoperative preparation pays rewarding dividends contributing to a smoother operative and postoperative course. Recognition and treatment of coexisting diseases and alterations of protein, electrolyte and fluid balance are important. Vitamin deficiencies, although seldom severe, deserve appropriate attention. Associated liver disease, especially in alcoholics, often requires adequate replacement of vitamin B complex and vitamin K. Restoration of blood and serum protein deficits is well appreciated. The serum protein level often inaccurately portrays the real tissue protein status. Obstruction frequently increases nutritional disturbances, requiring additional preoperative conditioning. Supplementary protein therapy and intermittent gastric suction are valuable in reducing the concomitant gastric and duodenal edema in duodenal obstruction.

Adequate operative exposure of the surgical site and pathologic process facilitates the safe accomplishment of the indicated surgery. The choice of incisions varies with the surgeon. Extension of the paramedian incision well up along the ensiform cartilage is helpful when either vagotomy or high resection is contemplated. A combined thoracoabdominal approach aids in the performance of total gastrectomy or esophagogastric resection, and also permits the placement of the anastomosis above the diaphragm.[12]

Following careful evaluation and preparation of the patient, the operative findings can usually be anticipated and the planned surgical procedure be performed. However, an initial quick, gentle abdominal exploration will reveal the nature of the primary disease and coexisting lesions, and aids in selecting the most suitable operation. The risks and hazards of the procedures will obviously be decreased when the qualities of flexibility, resourcefulness and surgical judgement are applied in determining the most indicated procedure rather than persisting in performing scheduled operations irrespective of the findings. When a swollen, edematous or deeply scarred and deformed type of "treacherous" duodenum is encountered in a patient scheduled for resection, abandonment of resection and substitution of the alternative procedure of vagotomy-gastroenterostomy may obviate complications without significantly de-

creasing the patient's benefits.[2,8] Direct surgical dissection and duodenal stump closure in the "treacherous" duodenum subjects the patient to an increased incidence of complications.

Partial gastric resection is the most popular operation employed in the surgical treatment of peptic ulcer. It produces highly satisfactory results from both the patient's and surgeon's standpoint. Because the Billroth II type of resection is employed far more often than the Billroth I resection, safe duodenal transection and stump closure is a frequent necessity, and therefore merits considerable emphasis. The success or failure of the Billroth II type of resection is affected more by the duodenal mobilization, dissection and "turn-in" than by any other part of the operation. In gastric ulcer and malignancy and in the majority of duodenal ulcers, the correct handling of this step poses no special problems. It is in the duodenum which is edematous or markedly deformed by ulceration and subsequent scarring where increased difficulties, dangers and serious complications are more likely to occur. Early appraisal at laparotomy of the type and extent of pathologic alteration of the duodenum and the determination of its suitability for various operative procedures are important in deciding whether gastric resection or alternative methods are feasible. In equivocal situations partial duodenal mobilization, yet keeping the operation reversible, permits anterior and medial duodenal inspection, allowing better evaluation of the possibilities of obtaining adequate stump length to permit safe stump closure. Division of the duodenum close to the pyloric muscle aids in preserving maximum cuff. Dissection of the duodenum medially away from the pancreas, when occasionally necessary, should be performed with extreme care, but is best avoided because of the dangers of injury to the pancreas, its ducts and the common duct. This vulnerability to injury is often increased by the anteroposterior shortening, contraction and duodenal deformity resulting from peptic ulceration and scarring.

During difficult duodenal dissection lateral mobilization of the duodenum and the occasional exposure of the common duct in the gastrohepatic ligament aid in appraising the relationship of the common duct and pancreas to the pathologic process and dissection involved. This lateral mobilization also facilitates the "turn-in" and permits an easier rolling of the closed stump onto the head of the pancreas without tension. Exposing and dissecting out the common duct, using a T-tube to delineate its course, has been recommended as an additional safeguard but is rarely necessary. Ulcer removal, while advisable in gastric ulcers, is not important in duodenal ulcer. The paramount consideration is securing a safe duodenal "turn-in."

In the presence of a satisfactory duodenum either a Billroth I or II type of resection may be used.[1,10,16,18] The Billroth I type of resection, however, requires greater selectivity and experience, applying more careful anastomotic technic with special emphasis on relieving tension and providing additional suture line protection. The safety and popularity of the Billroth II type resection is primarily because the jejunum is a far better structure for anastomosis than the duodenum, particularly when the latter is diseased. The stomach and jejunum are ideal structures for anastomosis and consequently this anastomosis rarely gives any trouble when the fundamentals of good anastomotic technic are applied.[12] Our preference for routine use has been the Hofmeister method, performing the anastomosis in an antecolic position, using a relatively short afferent loop[5,17] and anastomosing the proximal afferent loop to the lesser curvature side and the distal efferent loop to the greater curvature side. Narrowing, purse-stringing, kinking or twisting of the stoma or limbs of the jejunum are avoided.

If the greater omentum is thickened and heavily laden with fat, the mobilization of the stomach may be modified by dividing the greater omentum vertically, removing a central segment.[5,9] (Fig. 1.) This allows a shorter afferent loop and may prevent fat necrosis and infarction of the omentum.

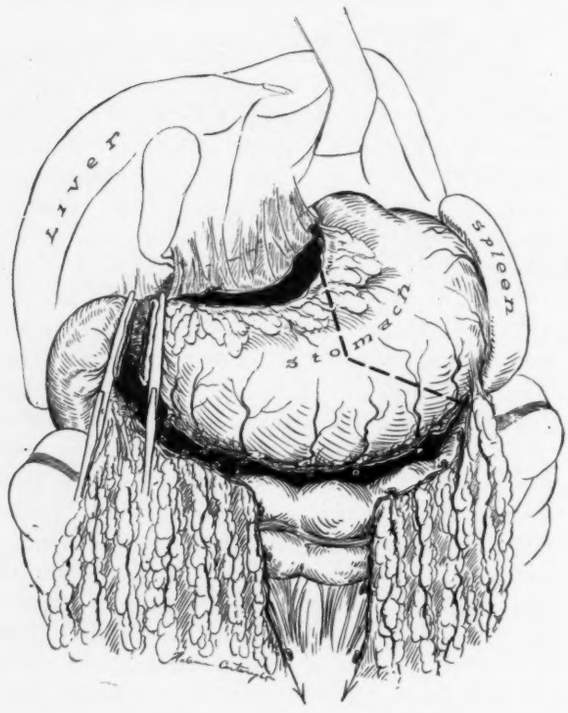
If a presumed benign ulcer is found to be malignant, a cancer type of resection is performed, removing a wide margin of grossly uninvolved stomach, the greater and lesser omenta, local lymph nodes and the spleen. The biologic behavior in the individual gastric carcinoma is unpredictable. In general the salvage rate with either subtotal or total gastrectomy has been disappointing, which relegates the surgical procedures to a palliative category in many cases. The wisdom of employing radical extirpative cancer surgery as routine seems untenable at present, especially in view of the

formidable morbidity and mortality rates that still accompany total gastrectomy. Improved methods, further experience and evaluation, and time will clarify this problem. (Fig. 2.)

Preservation of a portion of the stomach, when feasible, permits a better and safer anastomosis with lower mortality rates and an improved postoperative functional results. In diffuse gastric carcinoma, fundal and esophagogastric carcinoma a total gastrectomy is indicated and can be performed easiest through a left combined thoracoabdominal approach. When a gastric malignancy has invaded the body or tail of the pancreas, the colon, or left lobe of the liver, a portion of these organs may be removed with the mass if the patient is a good operative risk, realizing that usually only a short palliative result can be expected. When the malignancy is non-resectable, occasionally a palliative gastroenterostomy performed above the lesion will give a worth while temporary ameliorative effect. (Fig. 3.)

When emergency surgery is required for acute massive hemorrhage in a bleeding ulcer, the liberal use of blood, excellent general anesthesia and an experienced surgical team are important. Control of shock preoperatively and during surgery, rapid operative approach and appraisal of the ulcer site and probable bleeding source, with swift mobilization of the involved stomach or duodenal area and ligation of the important blood supply to the area usually controls the bleeding. The patient's condition markedly improves and the resection can then be performed almost like a routine resection. Partial resection is the procedure of choice in both emergency and elective bleeding ulcers.

In the acute perforated ulcer surgery is often necessary at all hours of the day or night when ideal facilities and circumstances are not optimum. Simple closure of the ulcer is all that is indicated at this time because the primary concern is saving the patient's life. However, occasionally, additional immediate supplementary procedures are necessary. Partial gastric resection is usually contraindicated in the presence of an acute perforation of the duodenum. Simple ulcer closure with vagotomy-



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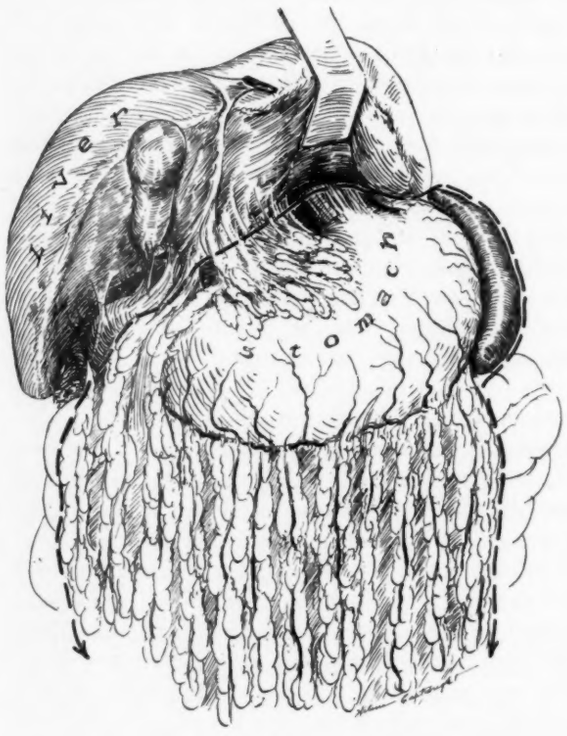

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FIG. 1. Hofmeister type resection showing division of lesser omentum and optional division of the greater omentum, with removal of a central segment of omentum. Line of gastric resection indicated.

FIG. 2. Dotted line indicates extent of extirpative surgery where total gastrectomy is required for gastric malignancy.

gastroenterostomy is quite feasible. It will relieve obstruction and give a curative type of procedure. A Finney pyloroplasty with vagotomy is also occasionally practical. These procedures may be required when the patency of the duodenal lumen is jeopardized by the requires a more complete resection in addition to vagotomy.

Subdiaphragmatic vagotomy with gastroenterostomy involves less surgical interference and is especially applicable in the presence of a "treacherous duodenum" or the poor risk case,

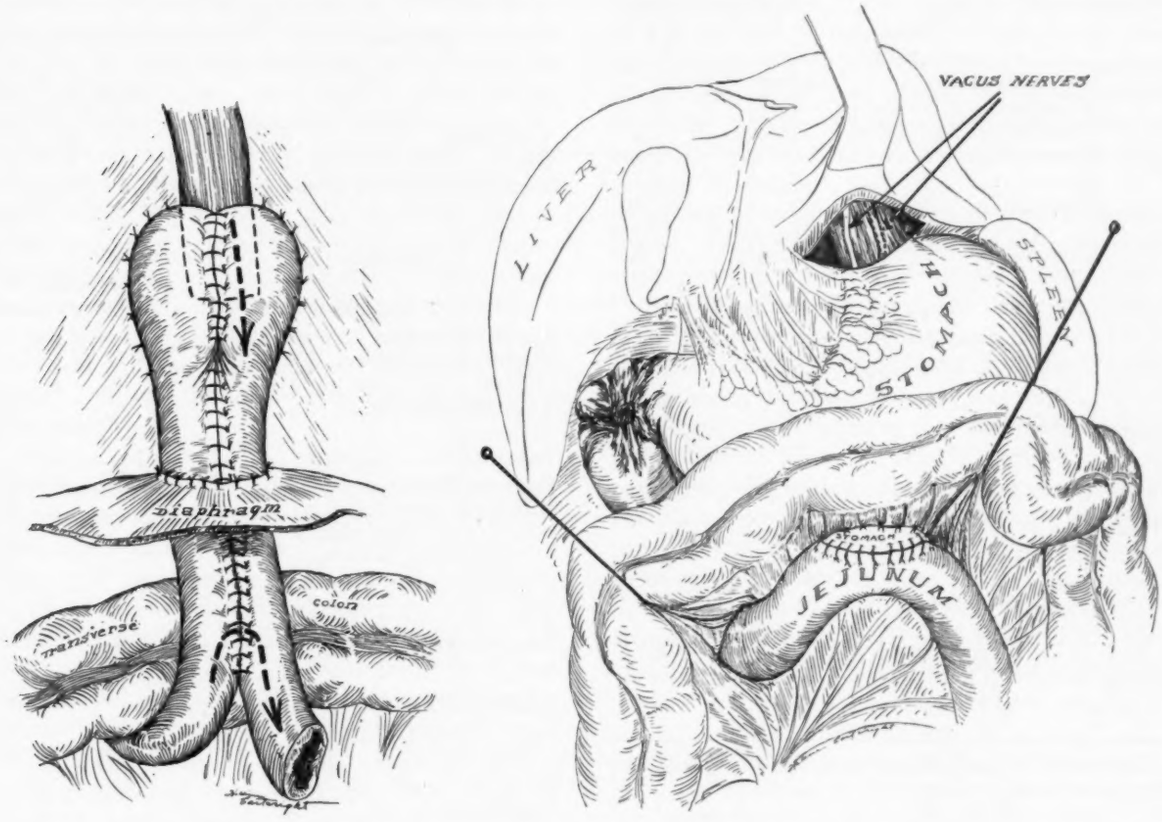

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FIG. 3. Preferred method of supradiaphragmatic esophagojejunostomy with large complementary entero-enterostomy following total gastrectomy.

FIG. 4. Subdiaphragmatic vagotomy-gastroenterostomy, as an important alternative procedure in the presence of a "treacherous or difficult duodenum."

ulcer closure. Their use has not increased either the morbidity or mortality rates in our experience.

Any discussion of gastric resection or methods of minimizing complications also involves a consideration of the role of the alternative procedure of vagotomy with gastroenterostomy, which is a very useful adjunct in the surgical treatment of peptic ulcer.[2,3,8,14,17,19] Vagotomy combined with resection seems to provide maximum protection against ulcer recurrence in the patient with a high emotional overlay. The patient with a stomal ulcer may be aided by vagotomy. Stomal ulcer with a poorly functioning gastrojejunostomy usually carrying a very low immediate mortality rate (0.67 per cent in 150 cases, M. B. N.). (Fig. 4.) Although a partial resection is generally the operation of choice, the final results in vagotomy with gastroenterostomy compare favorably with resection. In an elderly or a poor risk patient it is important to keep the surgery at a minimum; a simple gastroenterostomy may be the operation of choice.

The morbidity and mortality rates for elective gastric resection have shown a steady decline during the past two decades. Improved surgical technic, better anesthesia, antibiotics and other factors have increased the safety of all major operations. The incidence of pre-

viously well known serious complications following gastric resection, such as postoperative shock, hemorrhage, peritonitis, duodenal blowout, abscesses, etc., have been reduced to a very low rate. The methods used to control and prevent these serious complications are largely responsible for the improved results now obtainable. The effect of a rarer type of serious complication is demonstrated in the series of resections reported herein. The occurrence of this recently reported[6,20] postoperative complication produced a mortality rate of 3.57 per cent in eighty-four elective resections, which is higher than an over-all rate of about 2 per cent in approximately 600 resections for peptic ulcer.

This recent series consists of ninety consecutive partial gastric resections performed for peptic ulcers during the period from July 1, 1950, to January 1, 1953. (Table I.) Eighty-four resections were performed as elective procedures and six as emergency resections for acute massive hemorrhage. The age range for the patients with duodenal ulcer was from twenty-four to sixty-five years, with an average of forty-five years; those with gastric ulcers ranged from forty-four to seventy years with an average of fifty-four years. The duration of symptoms prior to surgery averaged six and a half years in the duodenal group, and fourteen months in the gastric group. The locations of the ulcers are listed in Table I.

TABLE I
LOCATION OF ULCER

Location	Number of Cases
Duodenal	57
Duodenal and gastric	5
Gastrojejunal	4
Gastric	23
Esophageal	1
Total cases	90

TABLE II
INDICATIONS FOR SURGERY

Indication	Number of Times Present	Percentage of Cases with Indication
Hemorrhage*	44	48.8
Intractability	41	45.5
Obstruction	18	20.0
Suspicion of malignancy or failure of gastric ulcer to heal	8	8.8
Stomal ulcer	4	4.4
Dysphagia; weight loss	1	1.1

* Massive hemorrhage necessitating emergency surgery—six cases.

TABLE III
ADDITIONAL OPERATIONS PERFORMED AT TIME OF GASTRECTOMY

Operation	Number of Times Performed
Vagotomy	20
Cholecystectomy	8
Repair of incisional hernia	1

TABLE IV
POSTOPERATIVE COMPLICATIONS

Complication	Number of Times Present
Wound infection	5
Bronchopneumonia	4
Dumping syndrome (mild)	4
Thrombophlebitis	2
Atelectasis	2
Pancreatitis	2*
Postoperative G. I. tract hemorrhage (mild)	1
Intestinal obstruction	1
Subdiaphragmatic abscess	1*

* Fatal complications.

TABLE V
MORTALITY

Type of Surgery	Number of Cases	Number of Deaths	Percentage
Elective	84	3	3.57
Emergency	6	1	16.66
Total	90	4	4.45

Hemorrhage, in most instances multiple episodes, led the list of indications for resection (48.8 per cent). These resections were performed as elective operations, except in six instances where acute massive bleeding required emergency resections. Intractability was a close second (45.5 per cent). Some degree of obstruction was present in eighteen patients (20 per cent). (Table II.)

At operation vagotomy was performed in conjunction with resection in twenty cases. (Table III.) It was added when the patient had a duodenal ulcer accompanied with high gastric acidity and his personality was of the nervous "ulcer type," in an effort to provide maximum protection against recurrent ulceration. Cholecystectomy was performed eight times, all for

chronic cholecystitis and cholelithiasis. These supplementary procedures did not increase either the morbidity or mortality rates.

The postoperative complications are tabulated in Table IV. In the elective series of eighty-four resections there were three deaths. (Table V.) Acute pancreatitis accounted for two fatalities and a left subdiaphragmatic abscess for one. It has only recently been recognized and reported that acute pancreatitis may follow gastric surgery and possesses more than a coincidental relationship.[6,20] Undoubtedly minor degrees of postoperative pancreatitis occur more often than we suspect. The etiologic factors that may precipitate this complication are as yet unknown. In both of our cases there was scarring of the duodenum sufficient to require a more than average amount of dissection. One wonders if its occurrence does not have a direct relationship to the local pathology and surgical trauma.

In the six resections required for acute massive hemorrhage as lifesaving procedures, five of the patients had an uneventful recovery. One death occurred in an elderly obese patient who was admitted in a near moribund state. Intensive conservative supportive treatment failed to result in significant improvement. He was operated upon with reluctance as a last resort measure, although the almost inevitable result was anticipated. His bleeding was controlled but he expired the following day without fully regaining consciousness. This type of patient represents one in which the liver damage and other irreversible changes secondary to massive hemorrhage in an elderly individual precludes a successful result even though the bleeding is controlled.

Emphasis and discussion of complications, considering the various etiologic factors that contribute to their occurrence, and the principles and methods involved in their prevention and elimination are important in obtaining improved results in operative surgery.

SUMMARY

The indications for partial gastric resection in peptic ulcer patients have been enumerated, with a more concise definition of intractability. Some important general and technical practical considerations that affect the results in gastric resection are discussed, particularly the handling of the patient with a "treacherous" duodenum and the avoidance of injury to the pancreas, its ducts and the common duct. Resection of the omentum heavily laden with fat is described. Reference is made to the factors important in the use of the modified Billroth I and II type of partial gastric resections. Certain other aspects of the ulcer problem have been commented upon, namely the handling of the patient with massive hemorrhage and the gastric ulcer which is found to be malignant at the time of surgery. The use of partial gastric resection versus the alternative procedure of subdiaphragmatic vagotomy with gastroenterostomy is clarified.

Ninety consecutive partial gastrectomies for peptic ulceration have been briefly analyzed with particular reference to the postoperative complication of pancreatitis. The mortality rate for the series of eighty-four elective resections was 3.57 per cent, and is higher in this series of cases than our total experience (2 per cent) primarily because this serious complication occurred in two of our patients. In the six emergency resections for massive hemorrhage there was one death (16.66 per cent). The combined series of elective and emergency resections gave an over-all mortality rate of 4.45 per cent in the ninety cases. The importance of studying and reporting complications is stressed as a method of making advancement in surgery.

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Garland et al. analyzed the results of 100 consecutive cases of primary breast cancer in two separate hospitals in San Francisco, most of which were treated by radical mastectomy with or without radiotherapy. They found that in general the results obtained were inferior to those reported by McWhirter in which simple mastectomy plus vigorous postoperative radiotherapy were used. Thus the authors naturally conclude that the McWhirter procedure is the superior one. (*Richard A. Leonardo, M.D.*)

Submucosal Rectal Nodules with Particular Reference to Carcinoids

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IN 1944 Buie and I pointed out that 7 to 8 per cent of submucosal rectal nodules are malignant or at least have malignant propensities. Again, in 1947, I dealt with this subject.[1] In these studies we divided this group of tumors into four categories: (1) benign, (2) inflammatory, (3) chemical and (4) malignant. Although the entire group has continued to hold our interest, the purpose of this report is to present additional cases in the malignant or potentially malignant group seen in the past seven years, namely from January 1, 1947, through December 31, 1953. It will be noted in this report that during this period there has been a rather marked increase in the number of carcinoids seen. This increase may be attributable (1) to the high degree of suspicion toward all submucosal rectal nodules and (2) to the fact that the rectum is being examined more often as a routine part of the general physical examination.

Most submucosal rectal nodules excised by my colleagues and me have continued to fall into the chemical category, that is, they have been attributable to injection therapy—they have had the histopathologic characteristics of lipoid granuloma. Although a history of injection therapy certainly suggests that the nodule is on that basis, three of the patients with submucosal carcinoids reported herein gave a history of injection therapy for hemorrhoids. Although certain features in the appearance and "feel" of the nodules might arouse suspicion as to their malignant or non-malignant nature, a definitive diagnosis is made only after local excision and microscopic examination. (Figs. 1 and 2.)

During the seven-year period under consideration there were a few other malignant submucosal nodules such as leiomyosarcomas, lymphosarcomas and lymphomas which will be dealt with in a subsequent report. The purpose of the present paper is to report on additional cases of carcinoid.

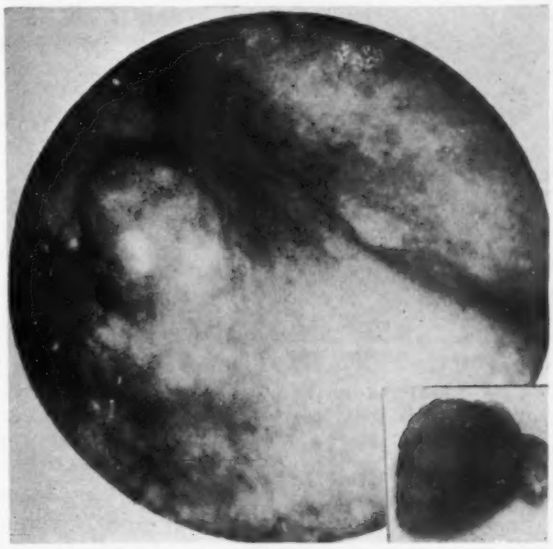

FIG. 1. Submucosal nodule measuring about 1 cm. in diameter and considered to be amenable to local excision. On histologic study this particular nodule showed the characteristics of grade 1 adenocarcinoma, carcinoid type. *Inset*, appearance of nodule after local excision.

Although this discussion is concerned primarily with submucosal rectal nodules, it is recognized that carcinoid of the rectum does become ulcerated by extension and erosion, and therefore may present as an ulcerated proliferative growth that is grossly indistinguishable from adenocarcinoma. In the past carcinoid of the rectum has been considered rare but increasing case reports in the literature indicate that progressively more cases are being recognized. The appendix and ileocecal region have been considered to be the most common site of occurrence of this tumor. This may have been true several years ago, but only because such tumors were not recognized in the rectum and because the significance of the submucosal rectal nodule was more or less unknown.

FIG. 2. Microscopic sections of the carcinoid shown in Figure 1. Hematoxylin and eosin, × 50.

During the seven-year period covered by this study 112 patients who came to the Mayo Clinic were found to have a carcinoid. (Table 1.) In forty-four cases (39.3 per cent) the tumor occurred in the rectum while in seventeen cases (15.2 per cent) it occurred in a bronchus, the next most common site. It is interesting to note that prior to 1947 fewer than a dozen cases of carcinoid of the rectum had been indexed in the files of the Mayo Clinic. Of course it is debatable whether or not the table should be used as an index of the relative incidence of location. The high percentage in the rectum is probably due to (1) the increasing awareness and the high index of suspicion with which rectal submucosal nodules in general are now regarded, (2) the relative ease with which the rectum can be examined compared to other possible sites of occurrence and (3) the fact that a proctoscopic examination is included much more frequently as part of the annual physical examination.

In a statistical study of the forty-four cases of rectal carcinoid it was found that twenty-three patients were men and twenty-one were women. The oldest patient was seventy-six years of age, the youngest twenty-six, with an average age of fifty-one years.

In twenty-seven of the forty-four cases the lesions were less than 1 cm. in diameter, non-ulcerated and submucosal, and were treated either by local excision or by biopsy and fulguration. (In three of the twenty-seven cases there were two carcinoids each.) In addition to these twenty-seven patients, six patients were sent to us from elsewhere with tissue or sections of tissue removed by the referring physician and proved to be carcinoid; according to the referring physician, the lesions appeared as small submucosal lumps. These patients likewise were treated by local excision or by biopsy and fulguration, making a total of thirty-three patients treated in this manner. Although some of them have been followed up for only a few months, others have been followed up for more than seven years with no evidence of local recurrence or extension of the lesion.

Three patients with small non-ulcerated nodules (less than 1.5 cm. in diameter) were treated by some type of radical operation such as a combined abdominoperineal procedure; one of these patients was found to have involve-

TABLE 1

SITE OF OCCURRENCE OF CARCINOID IN 112 CASES SEEN IN THE SEVEN-YEAR PERIOD, JANUARY 1, 1947, THROUGH DECEMBER 31, 1953

Location	Cases	Per cent
Rectum	44*	39.3
Bronchus	17	15.2
Ileum	12	10.7
Lung	6	5.4
Ileocecal region	5	4.4
Abdomen, peritoneal cavity	5	4.4
Liver	5	4.4
Small intestine, mesentery	3	2.7
Cecum	2	1.8
Appendix	2	1.8
Stomach	2	1.8
Pancreas	1	.9
Jejunum	1	.9
Ovary	1	.9
Cervix	1	.9
Neck	1	.9
Sigmoid	1	.9
Prostate	1	.9
Testis	1	.9
Extrarectal region	1	.9
Total	112	100

* Three patients had 2 submucosal carcinoids each, making a total of 47 rectal carcinoids in 44 patients.

ment of the regional lymph nodes. This was the case reported by Kunkel, Waugh and Dockerty.[3] One of the three patients was treated by radical operation because the biopsy showed grade 3 adenocarcinoma, carcinoid type, but at the time of operation there was no evidence of extension or metastasis.

The remaining eight patients had larger ulcerated lesions which unquestionably were not amenable to conservative local treatment.

Three patients with small submucosal lesions that were amenable to local treatment gave a history of having had injection treatment for hemorrhoids, so that clinically it was believed that the nodules were most likely chemical tumors; nevertheless, excision and study of sections proved them to be carcinoids.

SUMMARY AND COMMENT

One hundred twelve patients with a carcinoid tumor located somewhere in the body were seen at the Mayo Clinic during a seven-year period. In forty-four of these patients (39.3 per cent) the carcinoids occurred in the rectum, most of them as small submucosal nodules (1 cm. or less in diameter). The majority were asymptomatic, being discovered at the time of sigmoidoscopy or palpable on routine digital examination of the rectum as small, hard, pea-sized submucosal nodules. The most frequent site of occurrence in the rectum was on the anterior wall within 10 cm. of the mucocutaneous junction. Visualized through the proctoscope, many of the nodules were suspected of being carcinoids because of the yellowish appearance through an overlying normal mucosa. Although rare instances of metastasis from these small tumors have been reported, the results of treatment in this group indicate that they can be completely removed by local excision. If the location of the nodule in the rectum precludes local excision, removal of a specimen for biopsy and fulguration of the tumor constitute adequate treatment. To obtain a satisfactory specimen, it is usually necessary to bite away the overlying normal mucosa with the biopsy forceps so that tissue can be gotten from the nodule itself. The patient should be followed up at intervals of three to six months for several years. In general, carcinoids which are large or ulcerated or which seem to be infiltrated are best treated by radical surgical methods.

CONCLUSIONS

1. Carcinoid tumors of the rectum, at one time thought to be rare, are being discovered with increasing frequency.
2. Local excision is considered to be adequate therapy for the submucosal variety of carcinoid measuring 1 cm. or less in diameter.
3. Much can be accomplished in cancer prevention if the physician is alert to the malignant possibilities of small submucosal rectal nodules.

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Abscess of the Spleen

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ABSCESSES of the spleen have been reported periodically since the time of Hippocrates.[16] This famous Greek physician believed that one of three courses was followed by a patient with splenic abscess: he might die; the abscess might heal; or the condition might become chronic and the patient live with the disease.

Abscess of the spleen is now thought to be more common than was formerly believed. A study made at the Boston City Hospital[4] reviewed 7,914 autopsies and found thirty cases of splenic abscess. Twenty-two of these had multiple abscesses in the spleen; and in eighteen of these twenty-two cases, abscesses were found additionally in the brain, liver, lung, kidney and superficial soft parts. The remaining eight cases had solitary abscesses of the spleen. Billings[3] found twenty-four splenic abscesses in 3,600 reviewed autopsies. There were thirteen males and eleven females, with an average age of twenty-eight. Nine of the cases occurred in association with acute ulcerated endocarditis. In nearly all, positive blood cultures were obtained and multiple abscesses noted in the liver, kidney and lungs. Krumbhaar[20] studied 5,000 autopsies and found thirteen cases of splenic abscess. These were mostly multiple and relatively small. They are usually found only at autopsy and may be detected only microscopically. Single abscesses are larger and may practically replace the whole splenic pulp. Litten[25] recovered 15 L. of pus from a splenic abscess. The larger single abscesses are usually found at surgery. The chance of having a solitary abscess of the spleen without abscess formation in other organs is approximately 16 per cent, according to Walker.[35] Such an abscess may be sterile or any microorganism may be cultured, with the exception of the gonococcus.

Elting[11] believed that a considerable number of subphrenic abscesses were actually abscesses of the spleen and that splenic abscess occurred much more frequently in warmer climates. This was probably because of the increased incidence of typhoid, paratyphoid, malaria and dysentery. Jelliffe[19] believed that this condition was more common in the tropics and Wallace[36] reported forty-nine cases of splenic abscess in two years in the tropics. He believed this was the result of a peculiar type of relapsing fever. Three of the twenty-four cases of abscessed spleen collected by Billings were complications of typhoid fever. Montel[26] stated that the most frequently recovered organism was the typhoid bacillus and that the abscess was usually single and localized to the upper pole of the spleen. Esau[12] reported seventeen cases of abscess of the spleen which were attributed to typhoid fever. Sabrazes, Pauzat and Laubie[31] reviewed forty cases and found abscess of the spleen more common than thought in typhoid and believed typhoid bacilli could be found bacteriologically even when there were no clinical manifestations of the disease. Cuttner[8] believed that typhoid abscess of the spleen was relatively rare, 1:400 or 0.14 per cent of all abscesses of the spleen. Abscess of the spleen has been found as long as twenty months after the clinical symptoms of typhoid fever have subsided. Grand-Mourse[14] found this condition in only four cases of typhoid but in twenty cases of malaria. It may be that the cause of the enlargement of the spleen is not the direct cause of the abscess but produces "locus minoris resistentiae" in the spleen; and microorganisms gain a foothold which would otherwise be impossible. Abscess of the spleen then may follow any acute infectious disease, especially those associated with acute splenic tumors.

If we exclude the cases of splenic abscess that occur in people with known diseases of the spleen, the subject of splenic abscess becomes an interesting problem.

Kuttner[21] gave the following etiologic classi-

fication of these abscesses: (1) traumatic, which occur in about 15 per cent of cases; (2) resulting from extension from neighboring pathologic processes, such as gastric and colon neoplasms, which occur in about 10 per cent of cases; (3) resulting from metastatic spread of infection elsewhere (*a*, venous spread, usually from intra-abdominal suppuration and less common; *b*, via splenic artery, responsible for the largest number of cases). This third group is the most important and occurs in 75 per cent of cases.

Traumatic Abscess. An enlarged, diseased spleen may be ruptured as a result of some trivial injury as sneezing or heavy lifting. The injury may be forgotten or may occur during unconsciousness or while inebriated. Cases of spontaneous rupture of normal spleens have been reported.[6] Subacute traumatic rupture may last from a few hours to a few days or even weeks.[18] The trauma may result in a perisplenic hematoma or contusion of splenic tissue. Small extravasations of blood and subcapsular hematoma result. This collection of blood may be reabsorbed, may result in cyst formation or may act as a culture medium for pyogenic organisms. These organisms reach the spleen by way of the splenic artery from some distant source. It is probable that some temporary bacteremia is responsible.

Direct Extension from Neighboring Pathologic Disorders. Infected colonic or gastric neoplasms may invade the spleen; or an acute infection of the pancreas or a perinephric abscess may spread to the spleen.

Metastatic Spread of Infection. Since the spleen drains the blood into the portal circulation and receives no blood from this source, an abscess usually does not result from an intra-abdominal source, as is the case with the liver. However, cases of splenic abscess believed secondary to intra-abdominal disease have been reported. Elting's case[11] followed an abortion and Billings' case[2] followed puerperal sepsis. Venous channels from the female pelvic organs drain into the caval circulation and organisms must reach the spleen by way of the arterial circulation. Te Linde[33] remarked that extension of an abortive infection may advance upward along the ureter to the perinephric region. Infection could then gain access to the spleen by direct extension. Andrus' case[1] was secondary to a ruptured appendix with generalized peritonitis. Subphrenic abscess by direct extension may be the cause of spread, as in the case cited by Lang.[23] Wolfson's case[38] following appendicitis had extensive pylephlebitis and subphrenic abscess. The spleen was involved undoubtedly secondary to portal thrombophlebitis. Fauntleroy's case[13] followed a ruptured appendix with thrombosis of the splenic vein.

There are, therefore, instances of splenic abscess resulting from venous spread from intra-abdominal infection; but it seems unlikely that the spleen could be attacked by infection by this route without a liver and subphrenic abscess being produced as well.

It, therefore, seems logical that most metastatic spread of infection to the spleen must be of arterial origin. This route would be much more likely in the case of solitary abscesses of the spleen. The spleen receives enormous quantities of blood of arterial origin; and since its architecture is that of reticulo-endothelial tissue, it readily filters out pyogenic organisms, just as do the lymph glands in the lymphatic system. A diseased spleen, be it the result of an injury or some chronic disease such as typhoid, paratyphoid or malaria, falls easy prey to the infecting organisms and splenic abscess results.

Cutler[7] reported a case of splenic abscess in a twelve year old boy who suffered from a suppurative otitis media four weeks before admission. Diffuse peritonitis developed from a ruptured abscess of the spleen. No organisms were identified and the patient recovered. Homans[17] verified this and agreed with the etiology cited. Similar cases following middle ear infections were reported by Walker[35] and Pollock.[28]

Many other distant foci for spread of infection to the spleen have been reported: ruptured peritonsillar abscess,[10] furunculosis,[34] felon,[22] carbuncle of the neck,[3] phlebitis following an arthrotomy for knee cartilage,[24] frequent bronchitis,[14,20] lung abscess,[29] infected compound fracture dislocation of the wrist,[37] acute vegetative endocarditis,[3,20] infected upper lip[3] and suppurative cholecystitis.[3]

Schmeisser[32] reported two fatal cases of multiple necrosis of the spleen. One patient died of paratyphoid septicemia and the second ran a gradual downhill course from an abscessed molar tooth and later Vincent's angina, but with a negative blood culture.

Many instances of abscess of the spleen occur in which the focus of infection is unknown. This is found in conditions in which the

primary focus causes few symptoms and is masked by the findings of the splenic abscess. Clinical manifestations may develop in the metastatic splenic abscess from one day to several months after the appearance of the primary infection. When the latent period is long, the primary focus may have been forgotten or considered as an unlikely cause.

Pathogenesis. The mode of development of splenic abscess is the subject for speculation. It may be embolic or thrombotic in origin. Infarcts may develop from such emboli or thrombi. Some believe that the abscess may result from activity of microorganisms deposited in the spleen with infarction.[11] We know that infarction of the spleen is not infrequent. In the 3,600 autopsies reviewed by Billings[3] 141 cases of splenic infarcts were found and Krumbhaar[20] found 202 infarcts of the spleen in 5,000 autopsies. When an infarction occurs in certain infectious conditions, splenic abscess can develop. Most cases arise during the course of septicemia or bacteremia.

Perisplenitis is known to follow abscess of the spleen. It occurs as an acute inflammation of the capsule of the spleen and may be found in patches covering large areas especially of the convex surface of the organ. It occurs as a fibrinous or fibrinopurulent exudate on the peritoneal surface. Acute perisplenitis, however, is associated with any acute parenchymal lesion of the spleen besides abscess, such as necrosis, twisted pedicle, hemorrhage, infarct and some acute infections. Chronic perisplenitis is found in chronic diseases as malaria or splenic anemia, or associated with chronic fibrotic atrophy of old age. In Krumbhaar's review of 5,000 autopsies he found acute perisplenitis thirty-six times and the chronic form 675 times. Acute perisplenitis may go on to suppuration. This is quite rare but its occurrence would be extremely difficult to differentiate from a splenic abscess.

The spleen, as stated by Boyd,[5] is a great reticulo-endothelial sponge which acts as a filter to hold back bacteria from the blood. When one considers how frequently the spleen is exposed to chances of suppuration, a marked ability to resist infection must be assumed. The septic spleen seen in pneumonia and septicemia is enlarged and quite soft and contains enormous numbers of polymorphonuclear leukocytes but with no abscess formation. Thrombosis of the splenic vein secondary to pyophlebitis can result in splenic infarcts and abscesses. A number of other conditions may be considered as forerunners of splenic abscess. Diseased spleens such as result from torsion, fatty degeneration, movable spleens and long, drawn-out debilitating diseases as diabetes and tuberculosis are considered by Pollock[28] as etiologic factors. Rumold[30] thinks that primary tuberculosis of the spleen can result in an abscess and he recovered 5,500 cc. of pus from one of his patients. Grand-Mourse[14] mentioned overwork as a factor and attributed four of his reported cases to this. Hemorrhagic infarct may be considered as a precursor of this condition and Grand-Mourse listed an abscess of the spleen in three cases of scurvy and one case of purpura. Alcoholism has been listed as an etiologic factor, but whether portal hypertension or trauma incurred while under the influence of alcohol is responsible is not known. Congestion of the spleen following measles has also been considered to be a factor.

In these cases of metastatic spread to the spleen by way of its artery the infecting material must have traversed the lesser circulation and escaped the pulmonary network in order to reach the spleen, since a congenital cardiac defect is not commonly found.

Most cases of splenic abscess must result from the breakdown of infected infarcts; for where several abscesses were found, other infarcts in various stages of suppuration were encountered. The abscess often contains not only pus but also necrotic splenic tissue of various sizes. Frequently the entire spleen was found to be composed of a sequestrum. Kuttner[21] called this a sequestrating abscess of the spleen. About 37 per cent of cases were of this type.[18]

Clinical Manifestations. Symptoms are variable and depend on the location of the abscess in the spleen. They may be acute, subacute or chronic. Local symptoms may be mild and overlooked. Deep-seated abscesses may be painless and accompanied only by symptoms of suppuration such as septic fever, chills, sweat and leukocytosis. Fever may be moderate, continuous, intermittent or sometimes absent. Leukocytosis may be absent or exceed 50,000. Irregular chills are fairly constant. Nausea, vomiting and diarrhea have been noted. Pain is a fairly constant complaint. This usually comes on suddenly and is quite severe in the left hypochondrium. It may require morphine

for its control. Pain usually signifies a perisplenitis. If the diaphragmatic pleura is involved, shoulder pain may be noted. Pleurisy of the left lung base is common. Pain is aggravated by coughing or forced expiration. Involvement of the lower pole of the spleen gives peritoneal signs.

Enlargement of the spleen is practically always present. There may be tenderness and spasm in the left upper quadrant. There may be edema of the overlying soft parts and the skin may be tense and shiny. Occasionally costovertebral angle tenderness is noted.

Course. If untreated, splenic abscesses run a septic course. A few become chronic with sterile pus and produce few symptoms. The overwhelming majority go on to fatal termination if surgical intervention is not instituted. Prognosis depends on whether other organs are involved. In the case of solitary abscess surgical drainage offers excellent results. The abscess may heal spontaneously, in which case adhesions with adjacent structures are apt to develop and bring on a new train of signs and symptoms.[20] The abscess may rupture into adjacent hollow viscera or into the free peritoneal cavity with fatal generalized peritonitis. The abscess in the upper pole of the spleen may ulcerate the adjacent portion of the diaphragm with resulting empyema. Small splenic abscesses are absorbed.[9]

Inlow[18] reported nine deaths in eleven abscesses of the spleen secondary to trauma. In the two patients who lived the abscesses ruptured spontaneously into the stomach or colon.

CASE REPORT

H. K., a fifty-two year old white man, had a carious wisdom tooth extracted on October 28, 1952. Five days later a sudden catching sensation developed in the lower left chest anteriorly. On the following day the pain was described as "terrible," with chills and fever. On November 5th, when chills and fever persisted, the patient was admitted to the hospital. He vomited once and complained of indigestion.

On admission the patient appeared acutely ill, with a temperature of 39°c. Roentgenogram of the chest was negative. His temperature reached 40°c. in the afternoon, although blood cultures and malaria smears were negative. The white blood count ranged from 6,800 to 9,400, with a sedimentation rate of 32. Past history was non-contributory. The patient was given large doses of penicillin and symptoms subsided. He was discharged November 8th, three days after admission.

This patient continued to have pain in the left lower chest, with mild chills and fever. His symptoms periodically kept him from work and brought him to his doctor. His temperature was about 37.7°c., with white blood counts about 7,000. On November 25th his spleen was palpated and found to be tender. Again his blood culture was negative and a throat culture showed diphtheroids. He was again seen four days later when the spleen was again found enlarged and tender. A diagnosis of perisplenitis was made.

When the patient returned home, he experienced a sudden severe pain in the left upper abdominal quadrant and began to vomit and perspire. He was readmitted to the hospital in a pale, moist and dyspneic state. His blood pressure was 78/50, pulse 100 per minute and of poor quality. There was tenderness and rigidity throughout the abdomen, particularly in the left upper quadrant.

A diagnosis of ruptured spleen was made, but subphrenic abscess was considered. The peritoneal cavity was opened through a left subcostal incision and large quantities of liquid and clotted blood were found. A ruptured spleen was noted and removed. In the bed of the lower pole of the spleen on the posterior peritoneum a very firm indurated plaque was found which was solidly adherent and measured 4 by 6 cm. and 3 cm. in thickness. Because the patient's condition was so critical it was deemed ill advised to attempt to remove this mass. The patient received 2,000 cc. of bank blood during the procedure. He had an uneventful recovery and was discharged on the fourteenth postoperative day.

The pathologic report revealed the following. Grossly, the specimen consisted of a spleen which had previously been separated into three pieces. The subcapsular areas showed much clotted blood. The torn surface was friable, rough and irregular. Microscopically, the sinusoids were slightly dilated and empty. The red pulp contained an increased number of polynuclear leukocytes and eosinophils. Some of the reticulo-endothelial cells lining the sinusoids contained hemosiderin. The malpighian corpuscles were approximately normal in size and number and no germinal centers

were noted. Several small linear hemorrhages were seen in the parenchyma. A few of them extended through the capsule which was covered with clotted blood.

The diagnosis was subacute splenitis with traumatic rupture of the spleen.

The patient was readmitted to the hospital four months later, with a virus hepatitis from which he completely recovered.

Comments. This case apparently represents a splenic infarct secondary to an extracted carious tooth. An abscess resulted which during the process of healing ruptured at the weakest point between the normal splenic tissue and the "sequestrum."

TREATMENT

As stated, the treatment of choice is surgical in solitary abscesses of the spleen. Three routes are suggested:[11] (1) transpleural—resecting the tenth rib in the posterior axillary line and draining the abscess through the diaphragm; (2) abdominal, extraperitoneal; (3) retroperitoneal—if the abscess points at the flank.

A diagnostic puncture performed in the operating room may be helpful in locating the pus. The abscess can then be approached with the needle in place. Suturing the wall of the abscessed cavity to the peritoneum may be useful to avoid peritoneal contamination.

Splenotomy is usually the procedure of choice. Fifty-five cases of splenic abscess were gathered by Billings.[3] Splenotomy was performed in fifty-one, with seven deaths (13 per cent mortality). Splenectomy was done in four, with three deaths (75 per cent mortality). Hewitt[15] stated that medical treatment alone would be followed by cure in 50 to 65 per cent of cases. In Morel's study[27] forty-three of fifty-seven cases without surgical treatment terminated fatally, whereas all but one of thirteen patients operated upon recovered. Mortality in surgically treated patients is 20 to 25 per cent according to Walker.[35]

SUMMARY

1. The subject of splenic abscess is reviewed.

2. This condition is relatively common in instances in which the spleen is diseased or traumatized.

3. Metastatic spread of infection to the spleen is the common route and is most often carried by the splenic artery from some distant source.

4. Surgical drainage is the treatment of choice.

5. An illustration of a peculiar course of the disease is given.

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The most common cause of obstruction of the small bowel in the newborn is congenital atresia or stenosis. The baby's condition rapidly becomes serious unless prompt diagnosis and adequate therapy is instituted. Moore and Stokes recently reviewed forty consecutive cases, twenty-three with duodenal obstruction and seventeen with jejunal or ileal obstruction. The duodenal cases often present a diaphragm across the lumen with a central pinhole perforation. Persistent vomiting, often bile-stained, in the newborn is very suggestive. If the distal duodenum is involved, the pathologic condition is apt to be congenital stenosis; congenital atresia may occur anywhere in the duodenum. Ileal atresia may be single or multiple, and the necessary surgery varies with each case. (*Richard A. Leonardo, M.D.*)

Diverticula of the Pericardium

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THE authors have recently presented a review of the literature on pericardial coelomic cyst.[19] In preparing such a review we were struck by the number of cases (sixteen) which presented characteristic features. These included (1) variation in contour during fluoroscopic maneuvers and (2) definite communication with the pericardial cavity when viewed at surgery or autopsy. This group of cases we have considered as distinct from pericardial coelomic systs and are reporting them as diverticula of the pericardium.

TABLE I*
LESIONS WHICH MAY RESULT WHEN VENTRAL PARIETAL RECESS PERSISTS

Embryonic Condition	Lesion Resultant
The ventral parietal recess persists intact	Diverticulum of pericardium with wide base
Proximal portion is constricted	Diverticulum of pericardium with narrow base
Proximal portion is completely constricted	Cysts with pedicle which extends to pericardium
Is completely pinched off	Cysts in the cardiophrenic angle
Is completely pinched off and left cephalad as the septum transversum moves caudally	Mesothelial-lined cysts found higher in the mediastinum than the cardiophrenic angle

* From LILLIE et al. *J. Thoracic Surg.*, 20: 494, 1950.

Certain authors have distinguished between a hernia of pericardium and a diverticulum. A diverticulum is thus defined as a protrusion of both the fibrous and serous layers of pericardium. A hernia is regarded as protrusion of the serous membrane through a defect in the fibrous layer of pericardium.[6] We attempted to follow such a classification. Details, however, are too vague in the vast majority of reports to be accurate. The x-ray picture is indistinguishable and surgical treatment is identical. Because of these facts we have arbitrarily called all cases in this review diverticula. We have excluded cases which had an inflammatory process as the basis.[9,10] The embryology of the pericardium has been presented in our previous paper and need not be repeated here.[19]

Etiology. There are several theories of etiology: (1) *Lacunar theory:*[14] The pericardium is derived from a number of lacunae or spaces which form in the head region of the embryo. These lacunae later join to form the primitive pericardial coelom. Failure of union of one or more of these lacunae would be manifested in later life as a diverticulum. (2) *Ventral parietal recess:* The primitive pericardial coelom terminates in four parietal recesses. The dorsal two are better known since they are the pleuroperitoneal canals in the embryo. The ventral two have had little attention. Lillie and his associates[15] believe that persistence of a ventral recess results in a pericardial coelomic cyst when it is "pinched off" from pericardium and a pericardial diverticulum when it remains connected with the pericardial cavity. (Table I.) (3) *Congenital weakness:*[6,11] Potential weakness in the pericardium exists where vessels and nerves enter and where it blends with the great vessels. An increase in such weakness would lead to a diverticulum.

TABLE II

Symptoms	No.
Heart failure	1
Respiratory infection	1
Loss of appetite, fatigue	1
Cough, epigastric distress, nausea	1
Palpitation	1
None	6

Statistics. These were derived from fifteen cases in the English literature and one from the files of Valley Forge Army Hospital. The ages ranged from twenty-four to seventy-five years. Only two patients were under forty-seven years of age. There were eight females, five males and in three the sex was not noted. Six were noted to be white; there were no Negroes. The diverticulum was found on the right side in nine, on the left in four and anteriorly in two. In the remaining case the involved side was not noted. Symptoms are presented in Table II. These were not very helpful. No

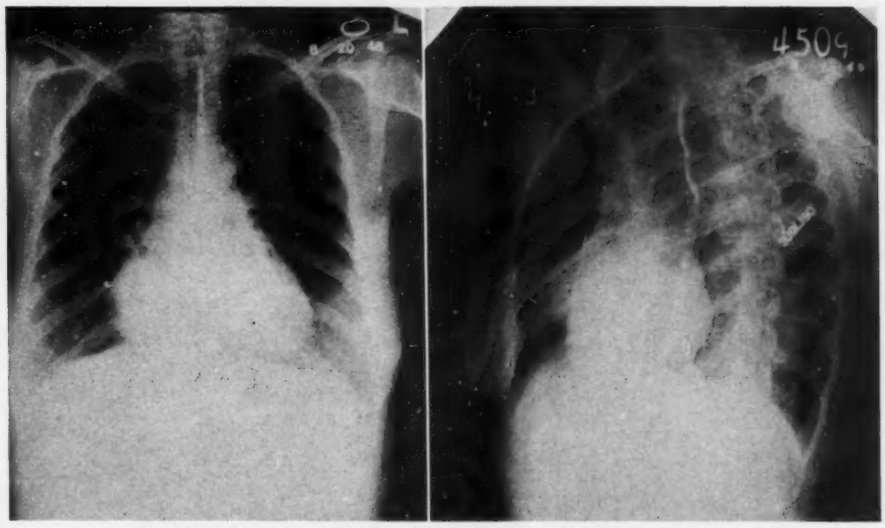

FIG. 1. Preoperative chest films.

mention was made in the literature of cure or alleviation of symptoms following surgery. Physical examination revealed no findings attributable to a pericardial diverticulum. Associated diseases are recorded in Table III.

X-ray Examination.[5,10,11,15,16] Roentgenology is the most valuable preoperative study. Correct evaluation will lead to a definite preoperative diagnosis.

A smooth round mass in either hilum will be seen on a plain chest film. It may occupy the characteristic position of a pericardial coelomic cyst in the anterior cardiophrenic angle. The mass may change contour during respiration, being long and narrow in inspiration and short and broad in expiration.[5,15,16]

Holmes (quoted by Mazer[17]) first suggested a change in contour during fluoroscopy. Since an open communication exists with the pericardial cavity, a decrease in size of the fluoroscopic shadow will occur when the diverticulum is in a position superior to the heart. Such a finding has been reported in several cases.[5,10,15]

Six cases have been treated by surgery.[2,5–7,16,19]

The first operated case was reported by Mazer in 1946.[17] The surgical findings have been identical in each case. At the time of thoracotomy a thin-walled cystic structure was seen attached either directly to or by a stalk to the pericardium. Fluid contents could be seen to move back and forth during the cardiac cycle. With slight pressure the contents of the diverticulum could be emptied into the pericardial cavity. The diverticulum was easily dissected free from the surrounding structures. The pericardial opening was usually closed with interrupted sutures.

There was no operative mortality; all postoperative courses were reported as smooth.

TABLE III

Associated Disease	No.
Congestive heart failure	2
Rheumatic heart disease	2
Laryngeal polyps	1
Asthma	1
Arthritis	1
Diverticulum of colon	1
Bronchitis	1

Pathology. Grossly the diverticulum was thin-walled. In autopsy cases where congestive failure was present several ounces of fluid were found in the sac. A short stalk was sometimes present.

Microscopically the wall was composed of loose connective tissue. The lining of the cyst was of endothelial or mesothelial origin.

CASE REPORT

CASE 1. This forty-seven year old white WAC Sergeant was admitted to Valley Forge Army Hospital on October 11, 1948. She recently had undergone a physical examination for the regular army. A routine chest x-ray was taken and showed a mass in the right mediastinum. (Fig. 1.) The patient had no symptoms.

Physical examination was entirely negative. X-ray report was as follows: "There is a round mass attached to right lower border of the heart." The electrocardiogram was normal

FIG. 2. Operative specimen of pericardial diverticulum. Clamp is on the communication with the pericardial cavity. Note the dumbbell shape.

both pre- and postoperatively. Laboratory work performed showed a vital capacity 74 per cent of normal, 93 per cent prothrombin content, 2 per cent bromsulfalein retention, total protein 6.5 gm, blood urea nitrogen 6, blood sugar 106. All other studies were within normal limits.

The patient underwent surgery on October 14, 1948. A lateral incision was made over the right side and the sixth rib removed. When the chest was opened it was immediately apparent that the mass was a cystic tumor. By blunt dissection it was easily separated from the adjacent lung. The major portion of the cyst could then be isolated from the pericardium and lower cardiac region. As dissection continued it became apparent that the cyst communicated with the pericardium through a necklike communication about 1 cm. wide. The fluid from the cyst could be pressed into the pericardial cavity. The cystic structure was lobulated and there were two main sections, the narrowed area being constricted by the phrenic nerve overlying it. It was freed from the phrenic nerve, the neck of the cystic tumor was then transected and the cyst removed. The pericardial sac was not closed. A routine chest closure was performed. The patient made an uneventful postoperative recovery.

The pathologic report stated "this specimen consists of a dumbbell shaped cyst that measures approximately 13 cm. in length and about 3–4 cm. in diameter. (Fig. 2.) The pedicle of this cyst structure is located in the narrow portion of the dumbbell. The inner surface of the cyst is smooth, glistening and pale. The outer surface of the cyst contains a few fragments of fatty connective tissue and an outer layer of smooth, white epithelium. These two layers can be separated grossly. Microscopically the sections taken through the cystic structure show it to be lined by a flattened layer of mesothelium that overlies numerous parallel layers of collagenase connective tissue. Between the two mesothelial surfaces there was a small quantity of fatty connective tissue that shows a mild infiltration of leukocytes."

SUMMARY

The English literature on pericardial diverticulum is reviewed. Fifteen cases are summarized and one case is added. Various theories of origin are presented. Diagnostic x-ray studies are given and the typical surgical findings are presented.

Acknowledgement: We wish to express our gratitude to Mrs. Lisabeth M. Holloway, Medical Librarian, Valley Forge Army Hospital, and Miss Rae Desimone for invaluable aid in compiling the bibliography and preparation of the manuscript.

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Crile recommends subtotal colectomy and simultaneous ileostomy for the 15 per cent of patients with chronic ulcerative colitis who fail to respond to medical therapy. (*Richard A. Leonardo, M.D.*)

Intravenous Vasopressors in Surgical Shock

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THIS article is prompted by the markedly successful use of two efficacious vasopressor drugs over the past two years at the Hertzler Clinic in the treatment of surgical shock. We propose in this report to present a series of fifty clinical cases so treated with intravenous arterenol or intravenous neo-synephrine® or both. This series, we believe, is ample to compare the relative merits of the two agents as well as determine the indications for their respective uses.

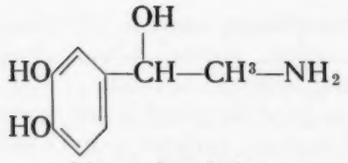
Basic to the evaluation of any drug therapy for shock is some understanding of the pathologic physiology underlying it and the action of such agents in reversing that state. Shock may be defined as a discrepancy between the size of the vascular bed and the volume of the circulating fluid. This discrepancy, or circulatory collapse, stems from a failure of the body's homeostatic mechanism to maintain the circulatory economy following stress, whether that stress be of toxic, hemorrhagic, neurogenic or cardiogenic origin. Whatever the etiology the resultant pattern is roughly the same, namely, low blood volume relative to the size of the vascular bed. This discrepancy sets in motion certain compensatory body reflexes to maintain homeostatic circulation. In brief, the course of events in shock is that venous return to the right heart is reduced, cardiac output is diminished and arterial blood pressure is decreased. This hypotension stimulates the pressoreceptors in the carotid sinus and the aortic arch with resultant cardiac acceleration and selective vasoconstriction, notably in the skin, kidneys, skeletal muscle and splanchnic area.[1] The latter is especially important to reduce the splanchnic pooling which contributes to further hypotension. The circulation to the brain and pulmonary mechanism suffers little if any impairment while the coronary arteries seem actually to dilate.[1] By such measures the body tends to maintain its internal economy for a short period, but in the face of overwhelming or long-continued stress these reflexes collapse with resultant shock; adjuvant therapy must then be initiated. (The role of ferritin V.D.M. and V.E.M. is thoroughly discussed in recent publications.[12])

RATIONALE OF VASOPRESSORS IN SHOCK

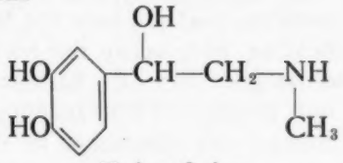
Successful treatment of shock reduced to its simplest terms requires the abolition of the discrepancy between the size of the vascular bed and the volume of the circulating fluid. Whole blood, plasma and plasma expanders must be given in adequate amounts to expand blood volume. Concomitantly, attention must be directed to the etiologic factors and their elimination, whether they be cardiogenic, neurogenic, toxic or hemorrhagic. To this end supportive measures must be instituted. These include: shock blocks to elevate the legs and increase venous return to the heart; intranasal oxygen to compensate for inadequate blood flow and tissue anoxia; anodynes for relief of any contributory pain and to provide mental ease; sedatives to decrease metabolic activity and provide physiologic rest; and warmth to reduce the body's response to cold but not enough to produce diaphoresis. Such measures are often sufficient to overcome hypotension and even shock, but when they are not, adjuvant therapy with vasopressor drugs seems indicated.

PHARMACOLOGY OF ARTERENOL AND NEO-SYNEPHRINE

L-nor-epinephrine (l-arterenol) is a primary amine which has been shown to be present in mammalian blood, the adrenal medulla of cattle,[4] and pheochromocytomas, and which undoubtedly bears a causative relationship to essential hypertension.[5] It is a sympathomimetic primary amine which differs in its chemical structure from epinephrine only in the absence of a methyl group on the nitrogen atom.



Nor-epinephrine

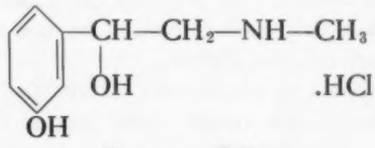


Epinephrine

Arterenol in man acts as a powerful generalized vasoconstrictor producing constriction of arteries, veins and capillaries. There is a resultant increase in total peripheral resistance and an elevation of systolic, diastolic and mean blood pressures. During its use pulse rate is slowed while cardiac output remains constant or is slightly decreased.[9] The hemoglobin concentration of arterial blood is significantly increased, probably due to the emptying of red cell reservoirs.[10] It produces a marked increase in cerebrovascular resistance with a decrease in cerebral blood flow, despite a substantial increase in mean arterial blood pressure, but no significant alteration in cerebral oxygen consumption.[7] A significant relationship between the level of consciousness and the level of blood pressure during arterenol therapy was noted in this series when comatose patients in shock regained consciousness with return to normotensive levels. Arterenol produces a decrease in renal plasma flow, leaves the glomerular filtration rate relatively unchanged[10] and usually produces an increase in the flow of urine.

The undesirable side reactions noted during this experience with arterenol were few. In two cases in which the fluid escaped the vein, marked necrosis and sloughing of tissue resulted. Secondly, patients tended to become addicted to arterenol; that is, hypotension returned with every effort to cease administration of the drug. In these cases it was necessary to substitute intravenous ACTH to succor the withdrawal of arterenol. Fritz and Levine,[3] and Ramey, Goldstein and Levine[11] have shown that adrenalectomized dogs do not show the same response to arterenol as normal control dogs and that this lack of response may be reversed by the administration of adrenal cortical extract. This leads to the interesting hypothesis that perhaps clinical patients may be victims of adrenal exhaustion with diminished secretion of adrenal cortical hormone following surgical shock. Such a thought gains credence with the results of this experience with arterenol in which certain patients required ACTH before being able to maintain their blood pressures unaided. Finally, arterenol is contraindicated whenever cyclopropane anesthesia is employed due to the possibility of increasing the risk of ventricular fibrillation.[7] In the latter event it was found propitious to utilize intravenous neo-synephrine.

Neo-synephrine is a synthetic sympathomimetic phenyl-ethylamine derivative intermediate between ephedrine and epinephrine. It differs chemically from the latter in containing but one hydroxy group on the benzene ring and that in the meta position to the aliphatic chain.



Neosynephrine

It is a moderately powerful vasoconstrictor and pressor drug which slows the heart rate and increases the stroke output.[6] It causes little or no tachycardia, irregularity in pulse rate or central nervous system stimulation. Either by compensatory reflexes or by direct action on the S-A node it has a tendency to slow the heart rate and should be employed with caution in instances of bradycardia and partial heart block.[7] Its vasoconstrictor action is probably largely peripheral but its pressor action is excellent.

The undesirable side effects of neo-synephrine are minimal and rare, and consist of anxiety, tremor, nervousness and headache. In five cases of thirty, or 16.6 per cent of the cases in this series, neo-synephrine failed to give the desired pressor response. In each instance arterenol was substituted with immediate and satisfactory pressor response.

DISCUSSION AND METHOD

L-nor-epinephrine is used exclusively in continuous slow intravenous infusion since other methods have been found unsatisfactory. The response of the patient to a single therapeutic intravenous dose of arterenol is either too

drastic or too fleeting or both. A single intramuscular dose is either not assimilated due to the hypotension or it is absorbed in an unpredictable manner.

The recommended dosage, and the one used most frequently in this series, is a concentration of 4μg. per ml. obtained by the addition of a 4 mg. ampul to 1 L. of a suitable vehicle such as blood, plasma, glucose water or isotonic sodium chloride. The rate of administration is largely dependent upon the severity of the shock and the efficacy of the other supportive measures, but ultimately on the response of the individual patient. The usual rate of administration, 20 to 40 drops per minute, is altered as indicated to keep the blood pressure stable at the desired level.

When postoperative fluid intake becomes a problem, the concentration may be altered. Some patients in this series treated with arterenol received as high as 16 to 20 μg. per ml. with a drip just sufficient to keep the 18 gauge tubing from clotting.

Due to local venospasm attendant on the use of arterenol, many users prefer the arm veins over the leg veins, since in their opinion the latter possess a greater tendency toward venospasm and subsequent slough. This writer does not believe that one is any more advantageous than another in this respect. Most of the infusions in this series were accomplished by use of an 18 gauge non-wetting polyethylene tubing inserted into the long saphenous vein. In several cases a femoral vein stab was done with a 14 gauge needle through which the 18 gauge tubing was threaded and the needle withdrawn. It is undoubtedly safer to use a plastic tubing threaded well up into a vein rather than a needle because there is less likelihood of seepage into the tissues with the tubing.

Fifty patients who were victims of surgical or neurogenic shock were treated with intravenous arterenol or neo-synephrine or both. In all but five cases continuous spinal anesthesia was used. Undoubtedly the type of anesthetic employed played a significant role in the production of shock but no greater role, certainly, than that of age, extent of surgery, general health and preoperative condition.

The preoperative condition has been classified as excellent, good, fair and poor. Those patients in excellent condition presented normal laboratory findings including 85 per cent to 90 per cent hemoglobin, normal proteins, normal kidney function, normal blood electrolytes and normal mental outlook. Those patients classified as good deviated in no more than two of the foregoing criteria and those only slightly beyond normal limits. Those patients that fell into the fair and poor classification were subjected to emergency surgery or surgery in which further preparations were not justified when balanced against the increased risk occasioned by delay.

In approximately one-third of the cases in which neo-synephrine was used it was started prophylactically on the basis of impending shock as determined by clinical judgment. In all cases in which neo-synephrine failed arterenol was substituted, with excellent results in all but one case. In this case the arterenol raised the pressure to desirable levels but the patient succumbed a few hours later to his disease.

RESULTS AND EVALUATION

The results obtained with intravenous arterenol and neo-synephrine in the treatment of fifty cases of surgical shock are presented in Tables 1 and 11, respectively. As indicated by the figures in Table 1 all thirty patients treated with arterenol obtained a positive and substantial pressor effect. Mayer and Ruben[8] found a similar response of twenty cases of twenty in their series dealing with surgical shock treated with arterenol. In no series reviewed was a similar 100 per cent result obtained.

Five of the thirty patients, or 16.6 per cent, succumbed and were classified as surgical deaths. In all five cases death was attributable to underlying disease or intercurrent disease having no direct connection to the shock or the use of arterenol. In all cases but one the blood pressure had been stabilized and arterenol discontinued for a matter of days or weeks. In the single exception (an operated head injury case) the patient had such severe brain trauma that survival was out of the question, yet a desirable pressor response was obtained.

In twenty-eight of the thirty cases the patient received transfusions, oxygen, intramuscular vasopressors and other supportive measures prior to the institution of arterenol therapy. In those two exceptional cases the shock was so precipitate and so profound that arterenol was begun immediately.

In one-third of the arterenol cases presented

herein it was found difficult to wean the patient away from arterenol, every effort to do so resulting in severe hypotension. In every case the shift was made by using corticotrophin in a dosage of 25 mg. in 1 L. of glucose with slow infusion over an eight- to ten-hour period.

head injury in which tracheotomy was performed. It is fairly certain that brain trauma was too vast to support life, although a satisfactory pressor response was obtained with arterenol until shortly before death.

In five of the cases, or 16.6 per cent, receiving

TABLE 1
ARTERENOL

Operation	Age (yr.)	Preoperative Condition*	Blood Pressure†			Time Run	
			I	AI	R	Time Run (days)	Outcome
Gut resection	71	F	140/90	80/60	120/80	1	Recovered
Abdominoperineal	62	F	120/70	60/40	140/80	3	Recovered
Gut resection	69	F	150/80	85/60	150/80	½	Recovered
Gut resection	71	E	130/90	90/50	140/80	1	Died, infarct
Gastrectomy	58	E	130/80	80/50	140/80	1	Recovered
Cholecystojejunostomy	66	F	120/80	90/50	120/70	1½	Died, carcinoma
Gastrectomy	61	G	140/100	70/40	160/90	3	Died, peritonitis
Colectomy	31	E	120/80	80/50	130/90	7	Recovered
Gastrectomy	60	P	140/80	75/50	140/90	2	Died, carcinoma
Gastrectomy	68	F	140/80	60/40	140/80	3	Died, uremia
Pancreatectomy	60	F	120/80	70/40	160/80	4	Recovered
Gut resection	78	E	120/70	40/?	130/90	5	Recovered
Gastrectomy	58	E	130/80	70/40	110/70	3	Recovered
Gut resection	66	G	100/60	70/40	100/70	1	Recovered
Abdominoperineal	70	E	114/70	40/?	150/100	2	Recovered
Cholecystectomy	52	E	110/80	80/50	130/90	3	Recovered
Gut resection	60	G	100/60	70/45	160/80	2	Recovered
Exploratory laparotomy	68	P	100/50	70/40	140/100	½	Recovered
Gut resection	70	E	120/70	65/40	110/70	½	Recovered
Abdominoperineal	70	G	120/70	75/40	120/70	½	Recovered
Gut resection	59	F	125/75	60/40	140/80	1	Recovered
Abdominoperineal	55	P	140/75	60/?	120/70	1	Recovered
Gut resection	72	F	160/90	70/60	140/80	2½	Recovered
Panhysterectomy	61	G	145/75	80/60	100/75	1	Recovered
Gut resection	54	P	150/80	85/65	140/80	3	Recovered
Panhysterectomy	58	E	120/80	40/?	100/60	2	Recovered
Panhysterectomy	40	G	140/80	60/?	140/80	1	Recovered
Herniorrhaphy	64	G	140/80	50/?	130/90	½	Recovered
Transurethral resection	65	G	160/90	100/70	145/80	½	Recovered
Herniorrhaphy	52	G	110/70	55/?	100/70	1½	Recovered

* E = excellent; G = good; F = fair; P = poor.
† I = initial; AI = at instigation of therapy; R = response 5- to 10-min. later.

Following one or two such infusions the patient was able to maintain his own pressure without further difficulty.

In several instances marked venospasm occurred at the site of infusion with resultant blistering of the skin and superficial slough. All such cases promptly healed without difficulty and with minimal cicatricial formation.

In the neo-synephrine group only one death resulted and that death was occasioned by a

neo-synephrine an inadequate response was obtained. In each instance arterenol was utilized next with a prompt and adequate pressor response. In all cases neo-synephrine was resumed after several hours of arterenol and was then able to maintain the blood pressure at adequate levels.

The first case of the neo-synephrine group was an especially interesting one involving a fifty-two year old white woman, in excellent

preoperative condition, who was subjected to a relatively simple herniorrhaphy. Spinal anesthesia was used, no particular surgical difficulty was encountered and blood loss was minor. Mid-way in the operation the patient went into profound shock. Plasma expanders, whole blood, oxygen and intramuscular vasopressors were used without avail. Arterenol was given intravenously at 60 drops per minute at a concentration of 8 μg. per ml. with a fair response. Blood pressure, which had been unobtainable, rose to 100/70. Since the jugular vein was the one utilized, a shift was then made to neo-synephrine with an immediate return to shock levels. Arterenol was begun again in the leg vein and a prompt response was obtained. Although the blood pressure remained at 100/70, the patient still appeared to be in shock. Her history revealed that she had been on cortisone therapy less than two months prior to surgery. The reports of Fraser et al.[2] and Salassa et al.[13] were recalled. These two articles warn of the danger of sudden collapse and death from postoperative adrenal cortical insufficiency in patients who require surgical treatment and who have had previous treatment with cortisone and related hormones. Salassa admonished that all patients who have had prior therapy with these hormones should be treated prophylactically, watched carefully postoperatively and treated promptly in the few instances in which adrenal cortical insufficiency is encountered.[13] This patient was placed on immediate cortisone therapy and within forty-eight hours was on a smooth postoperative course that led to eventual recovery.

TABLE II
NEO-SYNEPHRINE

Operation	Age (yr.	Preoperative Condition*	Blood Pressure†			Time Used	Outcome
			I	AI	R		
Hernia	52	G	110/70	80/60	NR	1 hr.	Recovered
Gut resection	75	G	110/70	80/50	130/90	2 days	Recovered
Subtotal gastrectomy	67	G	120/70	80/60	140/70	1 day	Recovered
Panhysterectomy	40	G	125/65	74/50	100/80	1 day	Recovered
Gut resection	60	E	140/90	60/40	140/100	1 day	Recovered
Transurethral resection	65	G	140/90	80/50	145/80	1 day	Recovered
Gut resection	65	G	120/60	110/60	150/80	½ day	Recovered
Panhysterectomy	60	G	145/90	0/0	150/80	2 days	Recovered
Tracheotomy	17	P	130/70	60/?	NR	½ day	Died
Gut resection	66	F	100/70	70/40	NR	1 hr.	Recovered
Gut resection	64	G	140/80	60/?	NR	½ hr.	Recovered
Panhysterectomy	58	G	120/80	0/0	NR	½ hr.	Recovered
Gut resection	59	E	155/85	90/70	140/80	1 day	Recovered
Gut resection	81	E	130/80	100/70	145/90	1 day	Recovered
Gut resection	77	F	130/70	110/70	145/70	½ day	Recovered
Gut resection	61	P	130/60	105/60	150/90	1 day	Recovered
Gut resection	58	G	130/80	115/80	140/100	½ day	Recovered
Gut resection	60	G	130/90	120/80	140/80	½ day	Recovered
Gastrectomy	66	F	130/60	115/70	150/100	1 day	Recovered
Gut resection	59	F	150/80	115/60	140/90	1 day	Recovered

*E = excellent; G = good; F = fair; P = poor.
†I = initial; AI = at instigation of therapy; R = response 5- to 10-min. later; NR = no response.

In eight of the twenty cases, or 40 per cent, neo-synephrine was started before shock developed. It was believed, in the operators' judgment, that shock was imminent or likely, and neo-synephrine was begun prophylactically. In the last two cases presented herein and in several cases subsequent to the collection of these data, neo-synephrine has been used wholly as a prophylactic measure with excellent results. In those patients judged shock-prone neo-synephrine is given before surgery and continued for several hours after surgery.

Shock no longer develops in such cases, where formerly it constituted a problem with the type of anesthetic used conjoined with the age of the patient and the magnitude of the operative procedure.

CONCLUSION

Intravenous arterenol and intravenous neosynephrine are two very efficacious vasopressor drugs which have proved to be valuable adjuvants to the therapy of surgical shock. Of the two, arterenol seems to be the more powerful, yielding a satisfactory pressor response in 100 per cent of the cases. Neosynephrine, while less successful (84 per cent response), has certain advantages over arterenol, namely, there is less danger of venospasm and slough at the injection site and there is less difficulty in discontinuing the agent. Neo-synephrine has proven a valuable agent in prophylactic therapy of shock. It is suggested from a review of the literature, as well as from the experience of this series, that arterenol and neo-synephrine are more efficacious in the treatment of surgical shock than shock from any other causes. Lastly, intravenous arterenol and intravenous neo-synephrine are recommended as valuable drugs in the therapy of surgical shock.

SUMMARY

Fifty cases of surgical shock successfully treated with intravenous arterenol or intravenous neo-synephrine or both are presented. A satisfactory pressor response was obtained in 100 per cent of the arterenol group of thirty cases and significant arterial blood pressure elevations were obtained in 84 per cent of the neo-synephrine group. The relative merits of the two drugs as adjuvant therapy in the treatment of surgical shock are discussed and the indications for their respective uses are proposed. The results are sufficiently encouraging to justify further careful clinical observation and evaluation.

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Ewing's Sarcoma of the Cervical Spine

WITH A CASE REPORT

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SINCE Ewing described what is now universally recognized as Ewing's sarcoma in 1921, the literature has been profuse with articles on this specific disease entity. Wang[1] described fifty histologically proved cases treated at the Massachusetts General Hospital from 1930 to 1952, inclusively. As a result of this study, external irradiation was considered the treatment of choice. McCarroll[2] believes that there is no single problem in the field of orthopedic surgery "more bewildering than the diagnosis and treatment of malignant bone tumor." He also stated, in his article,[2] that so-called metastases are actually independent lesions developing in conjunction with progression of the systemic disease.

The authors believed this case of a confirmed primary endothelial myeloma of the cervical spine should be reported, as a personal communication from the Armed Forces Institute of Pathology in Washington, D. C. revealed no previously reported similar cases.

CASE REPORT

A twenty-one year old married girl was seen for the first time on April 4, 1951, in the outpatient department of the New England Hospital (No. 190) complaining of a stiff neck and fever, both of one week's duration. Physical examination at that time revealed enlarged tonsils and generalized cervical lymphadenopathy. Examination of the blood showed a hemoglobin of 13 gm. with a red blood cell count of 4.48 million per cu. mm., and a white blood cell count of 11,500 with 53 per cent neutrophils (7 band forms), 45 per cent lymphocytes and 2 per cent monocytes. The urine contained a slight trace of albumin, 40 to 50 red blood cells, and 4 to 6 white blood cells per high-power field. The Hinton and heterophile agglutination reaction were negative. The corrected sedimentation rate was 1.19 mm. per minute, (normal .08 to .35 mm. per minute).

On April 16, 1951, the patient returned to the outpatient department and stated that the stiffness of her neck had become more marked. She was admitted to the hospital for further study. With more extensive questioning, her symptoms were found to date back to November, 1950, when she first noted stiffness in the back of her neck. At that time she experienced periodic episodes of stiffness, with pain, swelling and some difficulty in swallowing. Prior to November she had noted easy fatigability for about one year, but this was attributed to a known anemia. By February, 1951, after taking a position as a waitress, more intense neck pain developed, along with an increase in frequency of all her symptoms. Anorexia developed and a sensation of dizziness occurred whenever she bent forward.

Past history revealed that the patient had previously been in good health. Childhood diseases consisted of whooping cough, measles and mumps. A cough had been present since the age of ten, and in August, 1950, she had a streptococcal sore throat. There was a family history of tuberculosis. Her grandfather had died seven years before of tuberculosis, an aunt had died two years before of the same disease and an uncle had recently been discharged from a tuberculosis sanitorium.

The patient was married in February, 1946, and had a child the following year. There were no other pregnancies or miscarriages. The patient reported that during two family quarrels, her husband twice choked her into insensibility.

Physical examination revealed a thin, pale, young woman lying almost motionless in bed. Temperature was 99.2°F., pulse 82 and respirations 20 per minute. Blood pressure was 110/70. Tonsils were hypertrophied and cryptic. The pharynx was red without undue bulging and the gag reflex was absent. The neck showed a

diffuse swelling posteriorly on the left, with tenderness, but no warmth. The patient was able to flex her neck gently, but the movement caused pain. Flexion of the neck did not cause the thigh to flex. Lymphadenopathy was marked and diffuse in the neck, but absent in the axillas and groins. Blood study on admission showed hemoglobin 12 gm., red blood cells, 4.48 million per cu. mm., with white blood cells, 16,400; 65 per cent neutrophils (6 band forms), 31 per cent lymphocytes and 4 per cent monocytes. Urine was essentially normal. X-rays of the cervical spine showed a moth-eaten rarefaction of the spinous process and left lamina of the third cervical vertebra with a faint outline of a soft tissue mass around the process. The intervertebral space and the foramina were not widened. The body of the third cervical vertebra appeared normal. There was no retrotracheal or retropharyngeal soft tissue swelling. The alignment of the cervical spine was normal. It was concluded that the most likely diagnosis was tuberculosis of the cervical spine. X-rays of heart and lungs showed no abnormalities. Films of the teeth revealed multiple areas of caries and a periapical abscess about the root of a tooth fragment in the upper bicuspid area bilaterally. Another periapical abscess was present about the root of the upper left third molar. A retrograde pyelogram revealed no abnormalities of the kidneys. No acid-fast organisms were demonstrated in the urine. A lumbar puncture yielded clear, colorless fluid. The pressure was 195 mm. of water. Spinal fluid cell count revealed one white blood cell per cu. mm. Total protein was 32 mg. per cent. Tuberculin tests, 1:1000 and 1:10000 were negative. Agglutination tests for typhoid were positive in 1:40 for typhoid "O" antigen and negative for paratyphoid and brucellosis.

During her hospital stay, the patient improved on bedrest, sedation and gantrisin.® The swelling almost disappeared, although some pain was still present. Temperature became normal and she was discharged with a towel splint about her neck, on April 29, 1951, the fourteenth hospital day, to be followed in the orthopedic clinic of the outpatient department. Discharge diagnoses were: suspected tuberculosis of the cervical spinous process and lamina; periapical abscesses of teeth; dental caries.

She was fairly comfortable at home, and

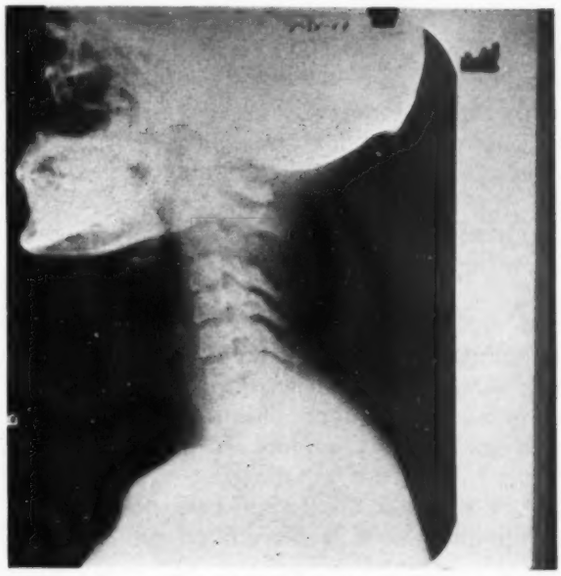

FIG. 1. X-ray of cervical spine, May 15, 1951. Note destruction in the third cervical vertebra.

on May 8, 1951, was measured for a neck brace. On May 10th she removed her towel splint, the neck pain became excruciating and her temperature rose to 103°F. This continued for two days and she was re-admitted to the hospital on May 12th.

Physical examination at this time revealed a temperature of 98°F, pulse 90 and respirations 26. Blood pressure was 108/70. Movements of the neck were restricted voluntarily because of intense pain in the posterior cervical region. There was slight tenderness to palpation. Otherwise, physical examination and blood studies were essentially the same as on the previous admission. Urine revealed a slight positive trace of albumin, a 2 plus acetone and 5–10 red blood cells per high-power field. The specific gravity was 1.024.

Re-examination by x-ray (Fig. 1) revealed an extension of the destructive process in the third cervical vertebra. The body and the right lamina were now involved in addition to the spinous process and left lamina previously noted. There was soft tissue swelling adjacent to this area, with small calcareous deposits. The body of the fourth cervical vertebra revealed minimal decalcification. The intervertebral disc had become narrowed. Findings were interpreted as an infectious process of the third cervical vertebra, probably tuberculous.

On May 14, 1951, streptomycin 5 gm. twice a day was started and continued for six days.

On May 17th, five days after admission, the patient began to complain of numbness and tingling in her lower extremities without impairment of motion. This became generalized on the following day and difficulty in voiding developed. Temperature at this time was 99.2°F. There was paralysis of the lower extremities on May 19, 1951, and she became incontinent of urine and feces. Two days later she was quadriplegic, with a sensory level at the clavicles. No reflexes were obtainable. Respiration was labored and shallow with the rate increased. Pupils were miotic. The patient complained of extreme pain in the neck on any movement and was pale and apprehensive. A lumbar puncture at this time yielded clear colorless spinal fluid with an initial pressure of 140 and a final pressure of 90 mm. of water. Total protein was 143 mg. per cent; white blood cells, 2.5 neutrophils per cu. mm.; red blood cells, 5 per cu. mm., all non-crenated. It was believed that the neurologic damage was due to cord compression with complete block from a possible dislocation of the third cervical vertebra, or to epidural abscess secondary to osteomyelitis, or to thrombophlebitis in the vicinity of suppuration. Surgical intervention was contraindicated because of the patient's condition. Cervical traction with Crutchfield tongs was then applied. On the following day slight improvement was noticed. Her breathing was less labored, the diaphragm was moving and she could move her toes and knees. Sensation returned over the abdomen. The improvement, however, was only temporary, and on May 23rd her temperature rose to 105°F. Breathing was markedly labored and frequent suctioning was required. She remained conscious until May 24th when she became comatose, developed Cheyne-Stokes respiration and an axillary temperature of 106°F. She died on May 25, 1951, her thirteenth hospital day. Final diagnosis was transverse myelitis of the cervical cord.

At postmortem examination the significant gross findings were limited to the cervical region. Bulging through the nuchal ligament in the third interspace was a grayish pink, soft, apparently well encapsulated mass measuring 1.5 cm. in diameter. This nodule was part of a tissue mass measuring 7 by 4 by 3.5 cm. which surrounded the spinous process of the third cervical vertebra. The vertebral body was replaced almost entirely by the same soft, grayish pink tissue which had perforated the periosteum and extended into the surrounding tissues of the neck. There was beginning involvement, apparently by direct extension, of the two adjacent vertebral bodies and spinous processes. Removing a segment of the cervical spine posteriorly, a plaque of tumor tissue opposite the third cervical vertebra had perforated the periosteum of the spinal canal without invasion of the dura. The cord opposite the third cervical vertebra was compressed and its consistency was semi-solid, suggesting pressure necrosis. There was no apparent tumor involvement of the spinal cord itself. The spinal canal was not narrowed at the second or fourth cervical vertebrae.

Incidental gross postmortem findings were hypostatic congestion and edema of the lungs, peritoneal adhesions and slight atheroma of the aorta.

Microscopically the tumor consisted of sheets and collections of medium-sized, moderately hyperchromatic cells with round or oval nuclei and scant cytoplasm. The sheets were separated by connective tissue septa containing blood vessels. In some sections the neoplasm had invaded striated muscle and fat and had surrounded bundles of nerve fibers. Focal necrosis, congestion and hemorrhages were present. No other malignant lesions were found. The microscopic diagnosis was Ewing's tumor at the level of the third cervical vertebra. In addition intracellular and perivascular edema of the brain, focal necrosis of the brain, aspiration in the lungs and cloudy swelling of kidney tubules were noted.

COMMENTS

The pathologic condition of a primary bone tumor resembling an endothelioma was first described by Lücke in 1886. Following this, numerous and varied descriptions appeared throughout the literature, but it was not until 1921 that it was established as an entity by James Ewing, whose name it bears.[3]

Ewing's sarcoma occurs more frequently than any other primary malignant bone tumor except osteogenic sarcoma.[4] It is a disease of childhood and adolescence, more than one-half of the cases occurring before the twentieth year, and 80 per cent before the thirtieth year Males are affected twice as often as females. The familial incidence of the disease is nonconclusive. In a recent study at the Mayo

Foundation, 11 per cent of the proven cases revealed that someone in the immediate family, or a relative, had died from some form of malignant tumor. Only one case, however, had a familial history of bone sarcoma in a sibling.[5]

The primary site of this tumor is usually in the shaft of the long bones, yet it has been reported by various authors to be found also in the clavicle, scapula, ribs, os calcis, ilium, sacrum, pubis and metatarsus. Occasionally an investigator refers to the vertebrae as being attacked primarily, but it is rare that a description follows with further localization. In 1947 Walker and Crowell stated, "this tumor occurs as a rule, in the shaft of long bones, but is encountered with sufficient frequency in the spine to establish the vertebrae as one of the sites of predilection."[6] The authors report one case involving the fourth and twelfth thoracic and the first lumbar vertebrae which followed a typical pattern of Ewing's tumor, yet they offer no further data to confirm the above-mentioned frequency in the spinal column. After reviewing the literature, it appears that the spine is not a common site and that cervical spine involvement is particularly rare. Coley, describing the various sites of Ewing's sarcoma in a series of 149 cases, reports only one primary lumbar lesion.[7] Morton, with 190 collected cases, reports six in the spine without further localization[8] and McCormack, Dockerty and Ghormley report, in their study of eighty cases, one in the vertebra.[5]

The etiology remains obscure. Many observers have postulated a relationship to trauma but this has never been adequately satisfied. There was a history of trauma in this case. Coley[7] raises the question of a virus as a contributing factor, being impressed by the early signs and symptoms which suggest an infectious origin. Again, no substantial proof can be offered.

The onset of this disease is insidious. Aching, boring pain is generally the first symptom, and intermittent fever may or may not accompany it. The pain rapidly increases in persistence and severity, being accentuated during rest. Disability follows early and progresses in proportion to the pain. Several attacks of this triad, pain, fever and disability, may occur prior to the discovery of a tumor. Once the tumor makes its appearance, it may grow rapidly and progressively or show occasional, temporary remissions. Morton[8] calls attention to its tendency to grow in spurts with intervals of quiescence. Examination of the involved area reveals a palpable tumor which may be discrete, regular, smooth and fusiform, or nodular, diffuse and ill defined. Local heat and tenderness accompany it. Weight loss is a late symptom and is generally a consequence of loss of appetite due to intense pain and discomfort. Blood chemistries are seldom abnormal, but in the late stages the blood calcium may be elevated; also, the phosphatase level may rise if a pathologic fracture ensues. The white blood count seldom is over 10,000.

Roentgenologic findings are not as typical or diagnostic as some of the literature might lead one to expect. The great variability in the appearance of the bones affected, as well as the resemblance to other bony lesions enhance the difficulty of the diagnosis. Ewing's sarcoma may imitate any bone disorder from osteogenic sarcoma to tuberculosis. Basically, the roentgenologic pattern is that of an osteolytic process, irregular in outline, and apparently of central or subcortical origin. When occurring in a long bone, it rapidly involves the entire circumference and the overlying periosteum takes on an "onion peel" appearance due to reactive bone formation. One recent study[5] identified four basic changes in the bony pattern: (1) mottled lysis, (2) sclerosis, (3) cystic loculation and (4) periosteal reaction. However, these changes were not always diagnostic and the entity remains evasive roentgenologically.

Grossly the neoplastic tissue is usually gray in color, but it may be pink to purple, depending on the amount of vascularity, hemorrhage and necrosis. In the early stages, the tumor proliferates diffusely in the bone marrow, then spreads through the shaft of the bone, in honeycomb fashion. The periosteum may lay down new bone longitudinally or deposit it irregularly. Nevertheless, the periosteum itself is soon invaded and perforated, and the tumor then reaches into the soft tissue, causing the swelling which may be fusiform or nodular.

Histologically one sees broad sheets of cells divided by fibrous septums which lend an over-all picture of lobulation. Some of the trabeculations subdivide to become very thin while others remain thickened and vascular. Occasionally the cells are in a pseudorosette arrangement. The cell itself is characterized by a round or ovoid nucleus with one or more

nucleoli. A faint cytoplasmic ring may or may not be present. Leukocytic infiltration is common and sometimes of such a degree as to obscure the true underlying malignant nature of the lesion. Giant cells are notably absent and mitotic figures are not abundant. The case reported herein showed essentially the features ascribed to Ewing's tumor.

The histologic picture, however, is not always as definite. A multitude of mistakes have been made and many of the tumors formerly designated as Ewing's have been re-classified after further study. Willis[9] writes that several workers reviewed their "Ewing's tumors" and found them to be neuroblastomas. He evidently does not believe in the entity Ewing's tumor and calls it a "dumping ground" for metastatic neuroblastomas, some metastatic lymphosarcomas, occasional non-ossifying osteogenic sarcomas, occasional radiosensitive reticulum cell sarcomas and other secondary tumors. He observed them all to more or less fulfill the Ewing criteria, and remarked, "when they are removed there will probably be nothing left in the dump." Rix and Geschickter[10] call attention to the remarkable similarity between this tumor and sympathacoblastoma. The microscopic pictures are strikingly alike, and with ordinary staining methods, differentiation is often impossible. In a series of 100 tumors not one was found which could unquestionably be called Ewing's sarcoma of the spine.

Thus one finds difficulty in recognizing this tumor clinically, roentgenologically, grossly and histologically. It is a mimic of all bone disorders, vague and elusive. As with all malignant processes, early diagnosis and treatment may offer longer survival, but lacking early recognition, the prognosis inevitably becomes extremely poor. Ewing's tumor metastasizes readily to other bones and to the lungs, lymph nodes and viscera. Death may occur in from two months to three years with an average survival rate of fourteen months.

The treatment may consist of irradiation, surgery, or the use of Coley's toxins. The tumor is highly radiosensitive, and it would follow that irradiation is the elective method of treatment. However, a five-year survival rate of 4.1 per cent is so low as to justify the use of every possible weapon for attack upon this disease. Therefore, intensive therapy usually consists of the use of two or all of the foregoing depending upon the case. Apparent cures have been reported following amputation alone, irradiation alone and amputation in conjunction with irradiation,[12] but no sense of security can be offered to victims through reports of these isolated cases.

SUMMARY

A case of Ewing's sarcoma, primary in the cervical spine, which caused death through pressure on the spinal cord with resulting quadriplegic and respiratory paralysis is reported. A discussion of the Ewing's entity follows, with emphasis upon the diagnosis and sites of predilection.

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The Results of Non-operative Treatment of Ruptured Lumbar Discs

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THE diagnosis of ruptured lumbar disc continues to be made with increasing frequency and is supplanting other diagnoses formerly frequently made to explain backache with or without radicular pain. It is apparent that morphologic alterations in the disc structure can in themselves cause symptoms independent of any retropulsion of the nucleus pulposus. All intervertebral discs, and in particular those of the lumbar area, undergo physiologic changes with aging. Biochemical studies show a gradual loss of the fluid content of the nucleus pulposus with concomitant loss of mucoid material. Histologically there is a steady increase in collagen fibers and a loss of cellular elements occurring as part of the aging process.

The precise relationship between the physiologic and pathologic alterations in the disc and the role of trauma in the production of symptons is not yet known. The disc problem, which formerly was concerned simply with establishing whether or not a disc was displaced, has expanded to include a host of related and perhaps more basic problems.

The present study is confined to an assessment of the results of non-operative treatment of definite lumbar disc ruptures. The current and broadened concept of disc disorder makes it more difficult to select a group of patients with definite disc ruptures without benefit of operative confirmation. It is for this reason that a critical selection of patients was employed and myelographic evidence of disc displacement was considered essential in addition to a definite clinical diagnosis.

Selection of Patients. These patients represent a selected group. Each was so severely afflicted with low back pain and root radiation that admission to the hospital for observation and treatment was recommended. Individuals with this degree of pain represent only the more severe fulminating segment of all individuals suffering disc disease and the results attained should be interpreted with this fact considered.

It is not our policy to submit all suspected ruptured discs to myelography. Only those patients in whom the question of a surgical procedure was considered had myelograms. Roentgenograms of the spine in each patient failed to reveal any other cause for the patient's symptoms and each individual's history and physical examination, as well as his subsequent clinical course, pointed to disc involvement as a primary cause of his difficulties.

Unquestionably many patients with ruptured discs were excluded because of a negative myelogram, yet it was believed that a critically selected small series with a diagnosis beyond question would shed more light than a larger diluted series.

The group studied consisted of thirty-six patients, twenty-seven of whom were examined and nine evaluated by letter. There were twenty-five males and eleven females.

Follow-up. The history of a patient with a ruptured disc is characterized by numerous attacks of disability interspaced between variable periods of freedom or relief from pain. Therefore, the value of any study is directly related to the length of the follow-up period. In this study the shortest follow-up period since hospitalization and myelography was a year and a half, the longest was ten years and the average follow-up four and a half years. The average time interval between the onset of back pain and the follow-up visit was much longer, being seven years. If we may consider that actual rupture occurred at the period the patient first experienced a severe attack of sciatica, the average period between this episode and the follow-up visit was five years.

Treatment. In most cases the decision to avoid surgery and treat the patient non-

operatively was made because the patient showed an encouraging response to bedrest, and a further trial of such therapy seemed indicated. In the remaining, the patient refused surgery.

Each patient was treated with a period of bedrest from one to three weeks and then was discharged with a back support which was worn for a varying period of time. Physical therapy was seldom employed. Each patient was instructed to limit his activities during the period of early treatment.

RESULTS

Pain-free. In this group are patients who have had no recurrence of either back pain or radicular pain. In spite of their apparent complete recovery, many still favor their back and refuse to engage in strenuous pursuits. Seventeen patients (47 per cent) are in this group. One patient in this group has been pain-free for eight years following his myelogram; the average follow-up period in this group is four years.

Mild Residual Pain. In this category are patients who have mild backache or leg pain of a recurrent nature. They have reported no episodes of pain severe enough to require loss of time from work or the care of a physician. In most instances they resort to a brace for relief of symptoms. Eleven patients (31 per cent) are in this group. The average follow-up period for these patients was five years. Back pain alone was noted in seven; four of these patients complained of occasional dull pain in the back and leg.

Severe Residual Pain. This group consists of individuals who have suffered severe pain intermittently or continuously in the spine or in combination with limb pain. This group also includes patients who have constant pain of a less severe nature not occurring in acute episodes. Eight patients (22 per cent) are classified in this group. The average follow-up period since myelography is five years.

Clinical Findings and Roentgenograms. Each of the twenty-seven patients reporting for follow-up had a complete orthopedic examination, which in most instances was negative. This is understandable as an individual subjected to examination during a remission of his disease would be expected to present few findings. This fact underlines the subjective nature of this or any report in a lesion characterized principally by pain occurring in an episodic manner. Thirty per cent of the patients showed atrophy of more than 1 cm., while ten per cent showed changes in reflexes.

Some patients had follow-up films for comparison with those taken at the time of their hospitalization, but no correlation could be made between the changes encountered and the residual symptoms. It was also impossible to relate the size of the original myelographic defect or the residual oil left after myelography with the clinical state of the patient.

Capacity for Work. The degree of residual disability may be evaluated also by determining how many individuals were able to resume their former types of work. Six of eleven laborers (55 per cent) returned to laboring work. Of those engaged in a non-laboring capacity 94 per cent returned to their former work. Two individuals failed to return to any form of occupation. One such patient is sixty-nine years of age and retired, while the other is restricted by pain brought on by any exertion.

COMMENTS

In 1948 a similar survey was published and eleven of the patients reviewed in this report were included in the earlier study. Of this number seven remained unchanged, three were improved over their former status and one patient regressed. The results in the present series, in which there is a longer follow-up, are better than those in the previous series. In 1948 twenty-eight patients were studied of whom 29 per cent were pain-free, 39 per cent suffered mild residual pain and 32 per cent were totally dissatisfied with their results. In the present series 47 per cent were pain-free, 31 per cent had residual pain and 22 per cent had severe pain. The results of conservative therapy reported by other authors in the treatment of displaced lumbar discs show considerable variation. Shinners and Hamby[10] reviewed cases with a history suggestive of a protruded disc and treated non-operatively, on the basis of a questionnaire. They found 30 per cent well and 70 per cent having some form of pain. Half of these patients had recurrent attacks of back and leg pain.

The results of operative therapy of ruptured lumbar discs as reported by many authors seem to substantiate each other within certain limits. About 60 per cent are pain-free, 40 per cent showing some residual pain and approxi-

mately 10 per cent of the latter figure are unimproved.

It would appear from this study that individuals having a ruptured lumbar disc with severe back pain associated with radicular findings and often with a background of many previous attacks will, in a substantial proportion of cases, have a full remission of symptoms over a period of years and return to their previous employment without surgical recourse.

The difficulty confronting the surgeon is the selection of cases for operative and non-operative care. Most authors use as their criteria for operation the failure of conservative therapy or the development of increasing neurologic signs or symptoms. Such standards, however, offer much latitude in interpretation. The duration of a conservative trial, the degree of clinical improvement anticipated and what constitutes adequate conservative therapy are variously interpreted. It is believed that a series such as is reported herein may help crystallize this facet of the disc problem.

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Management of Inguinal Hernias in the Aged

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AT the United States Soldiers' Home in Washington, D. C., there are 1,417 men, of which 315 are hospital patients. The average age of all members is 65.44, and the average age of the hospital patients is 71.14. Of the 315 hospital patients examined sixty or 19.05 per cent were found to have inguinal hernias. When the percentages in each age group were compared, it was found that an increasing incidence paralleled the increasing age. Landers[12] in his study of the age incidence of hernia concluded that inguinal hernia is a disease of age, its appearance paralleling the gradual weakening of supporting tissues. With the increasing number and proportion of the aged population, there is likewise a true increase in the incidence of inguinal hernia. Therefore it is to be expected that more and more elderly patients will present themselves to their physicians for treatment of inguinal hernia.

TABLE I
INCIDENCE OF INGUINAL HERNIA ACCORDING TO AGE GROUP

	40–49	50–59	60–69	70–79	80–89	90–99
No. of patients..	4	28	76	122	72	5
No. of hernias...	0	4	12	23	17	4
Incidence (%)...	0	14.2	17.0	19.7	24.5	80.0

In deciding whether or not to repair an inguinal hernia surgically in an elderly poor risk patient, consideration should be given to the extent of associated disease, the type of hernia, the presence or absence of symptoms and the possible later occurrence of strangulation if surgery is not performed.

THE POOR RISK PATIENT

The determination of the operative risk in elderly patients requires a knowledge of the pathologic physiology accompanying the aging process, for it is known that with aging there are changes in all bodily systems which, if advanced, will fail to support life under stress. This alteration of physiology which accompanies aging lowers the resistance of the organism to influences which would be innocuous to the younger individual. It is well-recognized that the older person is less able to withstand the extremes of cold or heat, emotional excitement or depression, infection and trauma.

Whether or not the manifestly poor adaptive mechanisms or stress responses in elderly patients are attributed to the central nervous system, pituitary gland, adrenal gland or the body tissues is a matter of conjecture. It is known that the poor response to damaging events is characteristically endocrinal in nature[17] and it could be that the hypothalamus fails to activate the adrenals or the body tissues do not react normally to the adrenal hormones. It has been shown that there is a decreased output of ACTH of the anterior pituitary in the aged in response to epinephrine administration[18] and a decrease in excretion of the steroids.[6,8,9] Jobson[7] observed that the decreasing tolerance to drugs, anesthetic agents and shock follow closely the downward trend of the basal metabolic rate as age progresses.

It would seem that the degree of advancement of the aging process would in many cases determine the degree of impairment of the stress response. Therefore, the extent of retinal, cerebral, coronary or peripheral-vascular sclerosis should be determined. The functional status of all organ systems should be investigated. The general appearance and physical capacity as well as other recognizable signs are also important indices of aging and should be evaluated, not necessarily because a wrinkled, gray-haired man will not survive the operation but because he might not survive the convalescence.

Moore[14] has commented on finding elderly patients sitting up reading a paper on the first postoperative day and acting as if nothing had happened. He calls this the depletion

response to surgery. Everyone who has operated upon elderly patients has observed this striking phenomenon. The patients look well and feel well when a young patient would be stricken with a stress response comparable to the magnitude of the operative procedure. The older patients simply do not react as markedly as the younger ones. Elman[4] and Moore[14] suggest that the diminished reaction in these patients is favorable in the absence of complications. With a complication such as infection the stress response is decidedly beneficial. White and Dougherty[21] have shown that elevated C-11 oxygenated cortical steriod levels resulting from stress cause a release of gamma globulins into the blood stream to be used by the body as defense against infection.

Sainburg,[16] Strenger[19] and others report a low mortality rate associated with elective surgery in the aged and concluded that indications for herniorrhaphy were essentially the same as for younger patients. Grace and Johnson[5] reported a mortality rate of 3 per cent in 1,032 herniorrhaphy patients over fifty years of age.

The long term survival rate and general state of health of the patient during this time should be considered as well as the mortality rate. At the United States Soldiers' Home we have been able to follow up the surgical convalescence of elderly patients not only for the customary period of hospitalization but also for months afterward. Although these patients were deteriorating at variable rates before and after surgery, it appeared that they aged more rapidly following surgery. The convalescent appearance of signs and symptoms of heart, brain and joint disease as well as other debilitating and perhaps lethal old age diseases suggested that the favorable operative response constituted a false security in many cases. Laidley[11] impressively describes the unexpected complications as concealed traps which are sprung without warning despite all anticipatory measures.

These intangible observations on the long term results cannot be easily represented graphically by reason of the variable rate of aging in different individuals and the abstruse character of many of the old age diseases. However, it is believed that the observations should weigh on the negative balance when deciding for or against herniorrhaphy in the aged poor risk patient. The important point to be gained is that in caring for elderly surgical patients precaution is the watchword.

TYPE OF HERNIA AND CONSEQUENCES OF NON-OPERATIVE TREATMENT

Over a twelve-year period from January 1, 1941, to December 31, 1952, there were 3,436 new admissions to the United States Soldiers' Home. During these years most of these men resided on the home grounds permanently. With the original census of approximately 1,400 men who also received hospital treatment, this series includes about 5,000 men. During this period only four operations for strangulated inguinal hernia were performed. In only one case was resection of gangrenous bowel required. If we assume the incidence of inguinal hernia to be 19 per cent in this older age group, the incidence of strangulation is 0.42 per cent and of strangulation with gangrene 0.10 per cent. Most statistics dealing with strangulated hernia include only hospital patients who were admitted with symptomatic hernias.

The incidence of strangulation of direct hernia is even lower. According to Watson[20] strangulation of direct hernias is rare. Andrews and Bissell[1] in 1934 recalled that they had never seen a case and could not find records of one in the 85,000 patients at the University of Chicago Clinics, or of the 100,000 cases at St. Luke's Hospital, Chicago.

Strenger[19] recommends operation for inguinal hernia in the aged, concluding: "A series of 82 poor risk patients over 60 years old, operated upon for hernia has been presented. Sixty-nine per cent of these patients had a complicating chronic or degenerative disease. Fifty-two of the 62 patients in the elective group had persistent symptoms from hernia which contributed greatly to their invalidism. Where trusses were worn they were inadequate. Operation had been deferred for years because of "old age" or a chronic medical condition. In the group of 62 elective cases, one patient died of cerebral accident 16 days after operation. Of 20 patients subjected to emergency surgery, eight died. The contrast between the mortality figures in these two groups offers a graphic argument for the elective use of surgery in the treatment of hernia in the aged."

Requarth and Theis[15] in surveying 500 acutely incarcerated or strangulated inguinal hernias at the Cook County Hospital in

Chicago found that emergency surgery was avoided in 60 per cent by manual reduction. One death resulted from the manual reduction. In the remaining cases in which emergency surgery was performed the mortality rate was 16.8 per cent. Other authors[2,13] cite the surprising mortality of 20 to 40 per cent in cases having interference with circulation and over 50 per cent in those cases requiring resection. They urge elective herniorrhaphy in all cases preferably before the sixth decade since most deaths occur between the ages of fifty and seventy-nine. They fail to account for the large number of inguinal hernias which develop after the sixth decade and the low incidence of strangulation.

Byrd[2] in 1950 reported the estimated population of the United States over sixty-five years of age to be 11,000,000 to 12,000,000. If 19 per cent of these or 2,280,000 with inguinal hernias were subjected to elective herniorrhaphy, there would be many unnecessary operative deaths. These facts coupled with the high recurrence rates (10 to 12 per cent in indirect hernias and 20 to 40 per cent in direct hernias) call for a more conservative attitude in dealing with asymptomatic inguinal hernias in elderly poor risk patients.

The following three cases are examples of problems encountered in managing these poor risk patients with inguinal hernias:

CASE REPORTS

CASE I. An eighty year old man was examined in 1950 and found to have a small left indirect inguinal hernia which was asymptomatic. Shortly afterward he became a permanent bed patient as a result of advanced cerebral arteriosclerosis. Despite his constant residence in bed, the inguinal hernia increased greatly in size. In January, 1953, the large scrotal sliding hernia was filled with inspissated feces and could not be reduced. There was nausea, vomiting, abdominal distention and obstipation. Because of his extremely hazardous physical condition it was decided to treat the obstruction conservatively. For two days he received multiple enemas before the fecal impaction was finally relieved and the hernia could be reduced. Following this there was no further difficulty with his hernia. However, he died two months later from his depleting medical illnesses.

CASE II. A seventy-nine year old man had the following diagnoses: generalized arteriosclerosis; arteriosclerotic heart disease; bilateral glaucoma with partial blindness; bilateral deafness; carcinoma, pyriform sinus with cervical metastasis; and right indirect inguinal hernia, incomplete. For many years he had been wearing a truss for his hernia and had had no symptoms. However, on one occasion the hernia became irreducible. The tense, tender, irreducible mass in the right scrotum was massive in size, extending halfway to his knee, but there were no signs of intestinal obstruction. Immediate operation was advised but the patient refused. The hernia remained irreducible for two weeks despite repeated efforts to accomplish reduction. Finally the patient succeeded in reducing the hernia himself and properly applied his truss. He had no subsequent difficulty with his hernia but died one year later with bronchopneumonia.

CASE III. An eighty-five year old man had severe arteriosclerotic heart disease and arteriosclerotic brain disease with dementia. A left indirect inguinal hernia was present for fifteen months. On one occasion the hernia was found to be tense, tender and irreducible. However, it was reduced after forty-five minutes of constant gentle pressure. During the succeeding two weeks he was closely observed and it would require fifteen to twenty minutes each day to effect reductions. It was observed that reduction was accomplished more quickly and with less difficulty than was possible on the preceding day. From the beginning efforts were made to have him properly fitted with a truss. However, because of the patient's demented state proper truss application and maintenance was impossible. Finally after this time the hernia could be immediately and easily reduced. When last seen eight months later there had been no instance of irreducibility.

OPERATIVE TREATMENT OF HERNIA

Except for one consideration the surgical treatment of inguinal hernia in the aged should differ little from the repair in younger age groups. The single exception lies in the handling of the spermatic cord. The defect at the internal ring should be closed very snugly to insure against recurrence. This closure may often compromise the blood supply to the testicle, but this is of little consequence in these elderly men. The gradual testicular atrophy which occasionally occurs is usually not noticed by

the patient. Grace and Johnson[5] report atrophy of the testicle occurring in an average of 26 per cent after division of the spermatic cord. They report only two patients of 125 with division of the cord in whom testicular necrosis developed. Both of these patients had wound infections which required removal of the necrosed testicle. The authors point out that necrosis occurs only when the testicle is disturbed from its scrotal attachments. Resection of the cord alone or with orchiectomy may be advisable in large combined direct and indirect hernias, recurrent hernias and sliding hernias.

The essential feature of hernia repair is simple anatomic closure of the defect without tension on the suture line. The defect in indirect hernias is a torn or stretched transversalis fascia at the level of the internal ring. As Zimmerman[22] points out, all that is usually necessary is high ligation of the sac and simple closure of the defect. To do more in the way of suturing the internal oblique muscle or the conjoined tendon to the shelving edge of Poupart's ligament may do more harm than good. Such a repair may defeat the purpose of the shutter mechanism of the internal oblique muscle. During straining, coughing or sneezing the muscle contracts and effectively closes over the internal opening of the inguinal canal. This sphincter-like mechanism can be demonstrated when performing a herniorrhaphy under local anesthesia. With a finger in the hernial sac a constriction at the internal ring is observed when the patient coughs.

In associated direct hernias the defect is also of the transversalis fascia. Here it is not necessary or advisable to open the typical dome-shaped sac, but simply to close the defect through which it presents. When the transversalis fascia is actually torn, the medial edge retracts beneath the shelving edge of Poupart's ligament. The transversalis fascia when normally passing inferiorly to insert into Cooper's ligament becomes thickened and actually attached to the posterior surface of the shelving edge. Krieg[10] calls this retracted fascia triangular fascia, and Clark and Hashimoto[3] call it the iliopubic tract. They urge the use of this tissue in the repair of hernias. We have routinely looked for this fascia and have always found it present. While it may have retracted well under the shelving edge, it can be utilized in most cases. When the transversalis fascia is attenuated and the adequacy of this repair is questionable, the medial torn edge of the transversalis fascia may be sutured to the shelving edge. Since the tear in the fascia in direct hernias occurs some distance above the shelving edge, bringing the medial torn edge to the shelving edge may occasionally result in too much tension on the suture line. This is also true in McVay repairs since Cooper's ligament is a greater distance away than the shelving edge.

In these direct hernias with large defects and attenuated unserviceable transversalis fascia, an Andrews or modified Halsted procedure may be indicated. In these procedures the external oblique is utilized to close the defect and the cord is transplanted above this suture line or resected if necessary. A relaxing incision in the anterior rectus sheath may sometimes be used to prevent tension on the suture line. We have never needed to use fascia lata grafts, tantalum mesh, skin implantation or other grafting procedures.

In sliding hernias the La Roche operation is recommended. However, on two occasions in more than the average poor risk patients we simply reduced the mass after excising as much of the anterior peritoneum as possible and then dividing the cord and completely closing the internal ring. They have not recurred after two and one-half years.

Femoral hernias have not been included in this discussion. The advisability of prompt operation on all femoral hernias is well known.

SUMMARY AND CONCLUSIONS

1. Inguinal hernias occur in about 19 per cent of men over fifty years of age. An increasing incidence parallels the increasing age.

2. Elderly surgical patients develop complications more easily and master them less easily. Although the operative mortality is low in inguinal herniorrhaphies on elderly patients, the rate of aging appears to be increased by the procedure.

3. A more conservative attitude is justified for asymptomatic indirect inguinal hernias in poor risk patients.

4. Symptomatic indirect hernias should be operated upon unless the risk is prohibitive.

5. Asymptomatic direct hernias which are not of the unusual diverticular variety should not be operated upon in elderly poor risk patients.

6. For indirect hernias surgical treatment

should consist of high ligation of the sac and anatomic closure without tension of the defect in the transversalis fascia. The defect should be closed snugly about the cord at the internal ring even if the blood supply to the testicle is compromised.

7. For combined indirect and direct hernias anatomic repair is also recommended. If this is not feasible because of a large defect and unserviceable transversalis fascia, the Andrews or modified Halsted procedure is indicated with or without resection of the spermatic cord.

8. For sliding hernias in poor risk patients reduction of the hernial mass, cord resection and complete closure of the internal ring may be the procedure of choice.

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Some Interesting Aspects of Burn Therapy

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THE survival rate of severely and extensively burned patients has greatly increased with modern technics and drugs. The survival of a patient with 70 per cent of his body surface severely burned and the unusual aspects of the treatment which may have contributed to this survival are reported herein.

CASE REPORT

M. K., a twenty-six-year old white man, entered the hospital an hour and a half after having been severely burned when the gasoline which he was using to melt tar spilled over his clothing and ignited. He ran around wildly and then tried in vain to stop the flames by rolling in the grass until someone wrapped him in a blanket and extinguished them. His clothing was completely burned off from the waist up. He was given ¼ gr. of morphine and sent into the hospital.

The patient arrived complaining of severe pain. Physical examination revealed the following: blood pressure 100/86, pulse 130, respiration 24. Second and third degree burns completely covered the patient from the waist up and there were first and second degree burns over the anterior thighs, legs and feet. Between 65 and 75 per cent of his body surface (as estimated by five different doctors) was burned. (Table 1.)

The patient was brought to the operating room where an intravenous injection of glucose and saline was started and blood for typing and cross matching withdrawn; ¼ gr. of morphine was given intravenously and the wound area irrigated with normal saline and superficially cleansed. No anesthesia was given. The 90 to 100°F. August temperature as well as the extensiveness of the burned area were factors influencing the decision to use the open air technic, except for the back which was covered with vaseline to prevent sticking to the sheets.

Upon return from the operating room, continuous infusions (alternating glucose and saline, type-specific plasma, glucose and water as the condition of the patient demanded) were kept running for the next forty-two hours to combat the very extensive loss of blood volume due to the escape of plasma into the injured tissues and some exudation of the wound. On the second day, since one intravenous administration of plasma running full speed was not enough to maintain blood pressure, a venous cut-down was done through a first degree burned area on the other leg. The total intravenous fluid intake for this forty-two-hour period was 26,500 cc., which included 11,500 cc. of type-specific plasma (the equivalent of replacing the normal circulating plasma three times), 4,500 cc. of glucose and saline, 9,000 cc. of glucose and water, 1,000 cc. of whole blood and 500 cc. of one-sixth molar sodium lactate.

TABLE 1

Surface Area	Berkow's Normal % of Whole Body Surface	Body Surface Burned (%)	Third Degree Burned Area (%)
Head	6	6	2
Arms and forearms	13.5	13.5	14
Hands	4.5	4.5	
Trunk: Anterior	20	16	5
Posterior	18	14	..
Thighs	19	9	..
Legs	13	6	..
Feet	6	3	..
Total:	100	72	21

All this therapy was undertaken without a single blood test, except pulse and blood pressure which were taken by placing the sphygmomanometer cuff over the second degree burned area of the anterior thigh and using the stethoscope in the popliteal fossa. The two

available saphenous veins in the lower leg were being employed as channels for treatment and it was believed unwise to jeopardize these veins by attempting to withdraw blood for tests. Blood pressure was checked every half hour and was not allowed to fall below 100/70. Another useful indicator of plasma volume deficiency was the patient's complaint of chilliness. In such a dynamic situation as the shock phase the constant personal observation by the doctor is required. On several occasions the call to the nurse for extra blankets and a hot water bottle was the first indication of the need for an increase in the plasma infusions.

Approximately forty-two hours after the burn was received the patient's blood pressure suddenly spiked, within a half-hour period, from 122/90 to 350/160 and all intravenous therapy was cut to a minimum, but the veins were kept open. About one hour before the reversal of the plasma loss to plasma absorption phase 200 mg. of cortisone had been given, but this was now discontinued. Blood pressure then stabilized at about 150/80. The shock phase of the burn was over. Intravenous administrations of glucose and water were continued at a minimum rate for two to three days.

About twelve hours later (fifty-four hours subsequent to the burn) laryngeal edema began to develop and respirations increased to approximately 33 and were extremely labored. A tracheotomy set was placed at the bedside, but due to the severity of the burns in the neck area this would be employed with great reluctance because of the inevitable tissue breakdown and infection. As a desperate alternate measure ½ per cent neo-synephrine® was used as a laryngeal spray on inspiration and its repeated use through the next twenty-four hours resulted in adequate relief of the laryngeal edema.

Blood studies at this time showed: CO_2 combining power 61 per cent, hematocrit 41 volumes per cent, red blood count 4 million, white blood count 3,000, total protein 6.5, blood chlorides 495 and urea nitrogen 16.4. The white blood count returned to a level of 10,000 soon after the cortisone was discontinued.

The patient was put on a forced high protein diet with protein supplement* and high vitamin intake (oral and parenteral). Fortunately the patient was very cooperative with the forced feedings. Tetanus toxoid, terramycin,® penicillin and streptomycin were given. Blood counts were taken and the patient received whole blood transfusions twice a week. Repeated serum proteins were done weekly and for the most part varied between 5.1 and 6.5 gm.

Daily urinary output was maintained at a level of at least 2,000 cc. during the shock phase, and no evidence of renal or hepatic toxicity developed as manifested by the repeated urinalysis, cephalin flocculation tests and blood urea nitrogen. The patient vomited for three to four days and had loose bowel movements for five to six days without any other evidence of gastrointestinal ulceration.[27]

Attention was then focused on local burn sites and maintaining the patient's protein balance. It was observed that with the open air treatment, a hard eschar formed over the chest and abdomen preventing serum leakage and infection; but this eschar on the arms cracked in many places and infection established itself beneath the eschar. Consequently, the open air treatment to the arms was abandoned and saline baths were employed to cleanse the arms. Antibiotic-impregnated gauze pressure dressings were applied with plaster splints in full extension. This seemed to give more comfort. Open air treatment plus antibiotic ointments and débridement were continued on areas about the neck that likewise cracked and became infected. Ointments employed were: bacitracin, polymyxin, aureomycin, penicillin, neomycin and nitrofurazone. They were changed from one to another as the bacteria flora became resistant to that particular antibiotic. The most satisfactory over-all one was aureomycin 3 per cent. Nitrofurazone was somewhat irritating and abandoned. Dressings on the arms were changed every week to ten days and saline soaks were employed before replacing the dressings.

Five weeks subsequent to the burn the third degree burned areas, approximately 20 per cent of the body surface, had been cleared up with the saline soaks and the areas requiring skin grafts were easily distinguished. In consideration of the deficiency of donor skin available and the added risk of general anesthesia, pinch-grafting seemed to be the wisest procedure. This would also result in a minimum of increased plasma-oozing surface. In two sittings approximately 500 to 600 pinch grafts were taken from the legs and placed over both arms and the anterior-superior chest. (Several smaller

* Gevral® in eggnog three times a day between meals.

third degree areas of the neck, ears, nose, abdomen, etc., were healing satisfactorily without grafting.)

The first dressing change showed about 97 per cent take on these grafts with growth. The patient seemed to be doing so well that blood transfusions were discontinued for ten days. When the second dressing change showed no further growth and death of some of the grafts and granulations starting to overgrow the grafts, twice-a-week transfusions of whole blood were resumed. It is interesting to note that although the hemoglobin was kept well over 100 per cent during the entire time, growth of the grafts seemed dependent upon further blood therapy. The grafts gradually fused to cover the grafted areas satisfactorily. The grafts seemed to do better on the lower part of the arm than on the upper arm.

The patient was discharged on November 7, 1953, continuing on a high protein, high vitamin intake and terramycin. He was followed as an outpatient, returning twice a week for whole blood transfusions and every ten days for dressing changes with saline soaks. The last blood transfusion was given on December 16, 1953, a total of 15,000 cc. of whole blood having been given. The patient's wounds were completely healed after four months.

COMMENTS

A review of the current literature indicates that modern trends in burn therapy emphasize several aspects of the treatment.

In handling the shock phase there is much discussion of the relative merits, quantities required, etc. of electrolytes,[10,22] plasmas[9,10,22] and whole blood.[10,22] More recent emphasis is being placed on the use of whole blood in place of plasma.[14]

The most generally accepted indicator of fluid volume required is an hourly check of urinary output.[10,11,13,21] Other recommended guides to therapy are hematocrits,[12] blood volume studies and formulas for therapy in relation to body surface involved.[8,10,13]

The use of ACTH[1,9,12,19,20] and cortisone[10,12] in the treatment of burns received great acclaim within recent years, but at the present time the claimed benefits from these drugs remain somewhat in doubt.[10]

There are also varied opinions as to the local treatment of the burn. Recent popularity is being given to a revival of the open air treatment,[10] while there are many advocates for the pressure dressings.[2,14] I agree with Evans[10] who points out that closed treatment of burns encircling the limbs is of particular value. It is impossible to maintain any degree of immobility with the open air technic, especially on the arms. Motion causes cracking of the eschar opening paths for infection. Pressure dressings with splints immobilized the third degree burn area and seemed to be more comfortable.

Maintaining the nutrition of these patients by forced oral high protein and high vitamin intake, blood and parenteral feedings including vitamin supplement is generally accepted.

Control of infection through the use of systemic antibiotic therapy is generally accepted, while the use of antibiotics on the local areas depends upon whether the open air technic or the closed technic is employed.

Early closure of the wound has recently been urged, several recommending that grafting be done as early as two to three weeks.[2,9,20] Cope et al.[8] even recommend immediate excision of the third degree burned area and grafting. However, this would not always be possible because of the difficulty in determining the depth of the burn immediately. In extensive burns the condition of the patient would not allow such a major operative procedure.

Points of interest in this case which differ from the generally accepted approach to therapy are: (1) In the shock phase of the burned state blood pressure readings alone were employed as a criteria for intravenous fluid therapy. (2) By employing these criteria the quantity of fluid therapy was much in excess of the normally expected and recommended requirements. (Table II.)

Since a blood pressure reading of 100/70 was set forth as a minimum standard, this patient's circulation was maintained continuously at an adequate level to prevent tissue anoxia and urinary shutdown. The fact that this patient was not allowed to be in shock may explain why he showed no evidence of renal or hepatic toxicity. In the treatment of shock from other causes blood pressure is generally employed as a current indicator of the patient's condition. It would seem only reasonable that in burn cases repeated blood pressure readings would give a more timely indication of the patient's condition than the urinary output, anuria being a delayed warning that the patient is already in shock. Urinary output was meas-

ured on this patient, but was not used as the primary indicator of fluid required.

Other criteria such as hematocrit, blood volume studies, etc. are valuable indicators, but all are of necessity delayed. These were neglected in this case during the shock phase because of the lack of available veins from which to draw blood. This is certainly not an unusual state in the severely burned patient. All fluid therapy in this case during all stages of treatment was done through the saphenous veins and their branches.

Table II shows that the fluids used in this case were in excess of that usually recommended by at least 55 per cent, and points out the fact that this excess fluid was chiefly plasma. It was grossly obvious that the excess fluid administered was located as edema fluid only at the burn sites. At no time was there any evidence of edema elsewhere. It was noted that the dependency of the burn site determined to some extent the amount of edema accumulated in that area.

The great danger of circulatory overload in these patients is at the critical point of fluid shift from the plasma leak to plasma absorption, approximately thirty-six to forty-eight hours subsequent to the burn.

Finland[11] in his study of the Cocoanut Grove patients concluded that administration of the large volumes of fluid necessary to combat shock did not necessarily predispose to development of pulmonary edema. Others differ with this statement.[10]

TABLE II

COMPARISON OF FLUID GIVEN INTRAVENOUSLY WITH THAT RECOMMENDED BY OTHER WRITERS*

Description of Fluids Given	Evans[10]	Cope and Moore[8]	Harkins[13]	Author's Case
Plasma, plasma substitutes or whole blood	(Wt. kg. × % body surface burn); 4,000 cc. max.	6,667 cc.	100 cc./per cent body surface burned; 7,000 cc.	11,500 cc. plasma; 1,000 cc. whole blood
Electrolyte solutions	Equal to above; 4,000 cc. max.	4,833 cc.	.....	4,500 cc.; 500 cc. ⅙ molar Na. lactate
Glucose and water	2,000 cc.	4,500 cc.	.....	9,000 cc.
Total fluids	10,000 cc. max.	16,000 cc.	.....	26,500 cc.

* Forty-eight-hour period.

SUMMARY

1. Intravenous therapy in combating the shock phase of the severely burned patient can be governed as to time and quantity given by blood pressure and pulse readings alone.

2. Quantities of fluids given (especially plasma) exceeded the usually recommended amounts considerably without causing ill effects.

3. Neo-synephrine laryngeal spray may be of great value in handling laryngeal edema.

4. The almost forgotten technic of pinch grafting may be of value in the severely burned patient in whom general anesthesia is a hazard and in whom there is a deficiency of donor area in relation to a much larger recipient area.

5. Close attention to forced protein feedings, vitamins and repeated whole blood transfusions are essential to maintaining the patient and getting grafts to take in the epithelialization phase of burn therapy.

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Acute Pancreatitis

A REVIEW OF EIGHTY-SIX CASES

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THE pancreas is known as the hermit of the abdomen, lying as it does retroperitoneally at a level of the upper lumbar vertebrae, and posterior to the lesser abdominal sac. It is superior to the transverse mesocolon and jejunum; its head is surrounded by the duodenal loop and its contact with the common duct makes its approach difficult and at times impossible unless the operator takes the chance of spilling infection throughout the general peritoneal cavity. Being an acinar, ductular gland the ductules are tributaries to the main pancreatic duct, known as the duct of Wirsung, which traverses the entire length of the gland.

We must bear in mind that a common channel exists beyond the junction of the ducts, and obstructions either from calculi or spasm of the sphincter of Oddi would allow reflux of bile into the pancreatic ducts or of pancreatic juice into the biliary ducts. If on the other hand the ducts continue separately as a certain proportion do, such reflux could not occur. The incidence of a channel varies in the experiences of various authors. Some say 60 per cent, others 20 to 30 per cent.

Because of the continuity of the lining mucosa of the biliary and pancreatic ducts, disturbances in the duodenal mucosa will influence both ducts; and as the common duct empties into the duodenum, it traverses the head of the pancreas. If the pancreas becomes enlarged, bile secretion is impaired. It has been definitely proved experimentally that pancreatic irritation can be produced by the injection of bile into the pancreatic duct or clinically by regurgitation into it.

It must be remembered that the head of the pancreas almost always contains a second duct, the accessory pancreatic duct (duct of Santorini), the relations of which are very variable. It usually opens by a separate orifice into the descending portion of the duodenum but is always connected with the main duct by a transverse branch. More rarely it empties directly into the main duct or it may be entirely absent.

The duct of Wirsung considerably augmented in size turns obliquely downward, backward and to the right, and comes into relation with the common bile duct, lying to its left side. Leaving the head of the gland, it passes very obliquely through the mucous and muscular coats of the duodenum and terminates by an orifice common to it and the ductus communis choledochus upon the summit of an elevated papilla situated at the inner side of the descending portion of the duodenum 3 or 4 inches below the pylorus.

We owe to Bartels[1] the knowledge of a relationship between the lymphatics of the pancreas and their neighboring structures. He showed that not only does a perilobular network of lymph vessels exist throughout the pancreas, but also that these anastomose with a similar network of lymphatics in the wall of the duodenum and with the lymphatics of the adjoining structures. It is believed by some that certain cases of pancreatic disease may be due to the entrance of a microorganism by way of the lymphatics. Our medical and surgical conception of the disease as emphasized by Von Mikulicz[2] in 1913 must of necessity be based upon the determining factors which bring about the lesion.

Physiology. The modern concept of the physiology of the pancreas may be summed up as follows: The acinar cells empty their secretion of digestive ferments into the ductular

system, reaching the duodenum by way of the duct of Wirsung. Nervous and hormonal factors incident to eating and the presence of chyme in the duodenum reach a peak two or three hours after meals. The secretory pressure of the pancreas exceeds that of the liver so that the reflux of bile into the pancreatic ducts by way of a common channel is prevented normally, while reflux of pancreatic juice into the gallbladder is more likely following a large meal or alcohol debauch.

One fact above all others has been determined, i.e., that acute pancreatitis with necrosis is due to activation of the pancreatic ferments. One school believes that it is attributable to the entrance of bile or other activating substances into the pancreas by means of the pancreatic duct. The other maintains that it is caused by a bacterial infection of the pancreas by means of the lymphatics.

The theory of Archibald,[3] still supported by a great many, is that the cause of pancreatitis is most frequently to be sought in the entrance of bile, sometimes of infectious bile, rarely perhaps of duodenal contents, in minute quantities which have found their way through the papilla, temporarily dilated by the recent passage of a stone, into the pancreatic duct.

We may summarize etiologic factors causing acute pancreatitis as follows:

1. Trauma which in itself may bring about the liberation of some toxic body formed by the escape of products, the result of proteolytic action in the presence of free blood due to blood vessel injury.

2. Diseases of the blood vessels such as arteriosclerosis, endarteritis and atheroma leading to thrombosis.

3. Conditions causing a reflux of bile or duodenal contents through the pancreatic ducts into the pancreas such as (1) gallstones; (2) stone in the common duct; (3) stone in the ampulla of Vater; (4) tumor of the ampulla of Vater; (5) tumor of the common duct; (6) cicatrization of the ampulla of Vater; (7) intestinal stasis.

4. By the lymphatic route especially by means of the lymphatics of the gallbladder and its neighboring structures.

5. By way of the blood stream, i.e., occurring in the course of the acute infectious diseases.

6. From unknown causes bringing about proteolytic pancreatic activity.

Claude Bernard in 1856 produced acute hemorrhagic necrosis of the pancreas by the injection of bile and sweet oil into the pancreatic duct. Opie, by the injection of bile in the pancreatic ducts of dogs, produced a necrotizing hemorrhagic inflammation of the pancreas resembling a human lesion and, like it, accompanied by fat necrosis. Roger and Garmier showed in their experiments that the injection of inactive pancreatic juice plus succus entericus into the veins of an animal produced typical symptoms of pancreatic poisoning and death.

Sweet[4] showed that a part of the pancreas of a dog when placed into the peritoneal cavity of another dog will cause death of the dog within twenty-four hours, the operation being performed under aseptic conditions. On the other hand, injection of large amounts of fresh normal pancreatic juice into the belly of a dog is followed by no symptoms. Archibald has found that infected bile deprived of its mucin or bile rich in salts would produce more extensive necrosis than normal bile salts.

Pathology. Fitz,[5] recognizing the importance of the pancreas, an organ heretofore more or less neglected, gave to the profession complete and comprehensive ideas regarding the inflammatory condition of the pancreas, which had hitherto been unknown. He divided the acute inflammatory changes into three groups, namely, hemorrhagic, gangrenous and suppurative.

Opie[6] expressed the opinion that the term acute hemorrhagic pancreatitis should be replaced by the name hemorrhagic necrosis, a term which could vividly describe the necrosis or death of the pancreatic parenchyma.

There has been a tendency, however, to consider these histologic pictures different phases and degrees of the same pathologic process. Two main classifications are now usually made: (1) acute interstitial (edematous) pancreatitis, and (2) acute pancreatic necrosis.

Other terms such as acute pancreatitis with hemorrhage, acute necrotizing pancreatitis and acute edematous pancreatitis have been used.

Relation to the Gallbladder and Biliary Tract. Due to the original observations of Opie, impetus was given to the study of the relationship between cholelithiasis and acute pancreatitis. Substantial support from both laboratory workers and clinicians have affirmed the interrelation of the two conditions. Pratt[7] found that gallstones are present in less than 50 per cent. On the other hand, William Mayo,

after reviewing the cases at the Mayo Clinic, stated that 81 per cent of pancreatic diseased conditions found at operation were due to or accompanied by gallstones.

Whipple[8] has found that the pancreas is involved in biliary tract diseases more often than heretofore realized, as shown by carefully analyzed case records. In our series of eighty-six cases definite information at operation by radiograms or at autopsy could be obtained in fifty-six cases. Of these the following conditions were found: calculi in gallbladder, eighteen; calculus in ampulla of Vater, one; calculi in ampulla of Vater and hepatic duct, one; acute cholecystitis, three; chronic cholecystitis, four; calculus in the common duct, one; cholecystectomy two to three months prior to admission, two. Meticulous examination at operation and cholecystograms proved to be entirely negative in twenty-six cases. No investigation was made in thirty cases; many of these patients were to be radiographed after leaving the hospital. Finally, 53.5 per cent of the patients had gallbladder and biliary tract involvement; 46.4 per cent were entirely negative.

A statistical study of the presence of gallstones or affections of the liver and biliary ducts in this lesion noted during operation is important; but owing to the shock which so often follows in the wake of this disease, the surgeons cannot in many cases conscientiously believe that they have a right to make a thorough investigation of the biliary tract. The fear of spreading infection, the desire to manipulate intraperitoneal contents as little as possible and the difficulty anatomically of palpating deep structures in this lesion have very often precluded complete intraperitoneal survey. For these reasons we believe that many cases probably accompanied by gallstones or other evidences of stenosis are never thoroughly investigated at the operating table, with the result that accurate statistics cannot be formed unless made at operation, radiographically or at autopsy.

With the advent of the antibiotics and with the now almost perfect technic of radiography, it is our opinion that more light will be thrown upon this most interesting question. It is our belief that statistics will show a preponderance of facts showing that the relationship between gallbladder and biliary tract affections is very great.

Although statistics and viewpoints of various surgeons may differ somewhat, we are sure that all agree there is a close relationship and that affections of the gallbladder and biliary tract must be recognized as definite, most important factors.

In our cases, 77.3 per cent gave a positive history of recurring attacks of so-called "indigestion" or gallstone colic.

Symptomatology. Probably due to the rarity of this condition as compared with the frequent occurrence of so many of the acute abdominal diseases, the average physician or surgeon of even a few years ago was prone to overlook a case of acute pancreatitis; and if he had that condition in mind, he believed that the making of a tentative diagnosis was more or less a "shot in the dark" and was loathe to give utterance to it. It has been a tradition handed down by many medical and surgical collaborators that there was no definite way in many cases of making a true diagnosis of an acute inflammation of the pancreas; of late, however, we are more conscious of the condition as being more frequent than has heretofore been thought. The average physician and surgeon has developed a more or less acute consciousness of pancreatitis and we are not as baffled as before.

From a clinical standpoint we observe the transient or usually milder form and the culminating or catastrophic form which runs a very stormy and frequently fatal clinical course.

In the ultra-severe or catastrophic type the most striking symptoms are pain and shock. The former is usually agonizing. It is usually constant with but little interval between the paroxysms and is seldom controlled by morphine. The pain generally originates in the upper abdomen, most often in the epigastrium and right abdominal quadrant, radiating to the left or the right of the median line and then gradually over the entire abdomen, and is preceded as a rule by a general abdominal soreness. Radiation to the back occasionally occurs. In this type of case intense pain has been a constant factor. Profound shock and collapse accompanied by an increased rapid pulse rate with a distinct fall in blood pressure soon ensues and the patient becomes markedly prostrate. Early circulatory collapse is pronounced and the presence of cyanosis and dyspnea with a fairly good pulse and without demonstrable cardiac or pulmonary cause is

quite typical of this form of acute pancreatitis. As a rule nausea and vomiting is persistent and gastric lavage or medication rarely gives relief. This is the type of case that Dieulafoy described as the "pancreatic drama." Landon[9] very appropriately said of this form, "One cannot help being astounded and alarmed that an important and necessary organ is capable of turning upon its possessor with such frightful and destructive violence."

A mass may or may not be present; as a rule it is absent. Distention is usually greater than muscular rigidity although the latter is always present to a certain extent, most pronounced in the epigastrium and the upper quadrants and to a lesser degree in the lower quadrants. It is surprising that so often in these very acute cases rigidity is not too pronounced. This applies also to abdominal tenderness although epigastric and upper quadrant tenderness is practically always present unless the patient is extremely toxic; then both tenderness and rigidity may be absent. Excursions of the alae, cyanosis and dyspnea are usually present. Abdominal clicks gradually disappear.

Leukocytosis is variable but in most cases it is fairly elevated. The presence of glycosuria, although an anticipated sign due to the relation between the pancreas and carbohydrate metabolism, is so seldom noted in the acute cases that its reliability as a diagnostic sign has been over-exaggerated. Occasionally sugar is found in the urine, as is acetone, but we are more apt to observe it in the long-standing cases. Hyperglycemia is so often present that it should be looked upon as of the greatest importance. Its absence should not, of course, negate the possibility of acute pancreatitis, but its presence should immediately be a signpost for the possible existence of an inflammatory condition of the pancreas. When following up a series of cases it is quite noticeable how little correlation exists between glycosuria and hyperglycemia.

Glycosuria was found in nineteen cases, not found in thirty-six cases and not taken in four cases. Hyperglycemia over 100 was found in twenty-four cases and below 100 was found in four cases.

Calzavara's[10] experiments have shown that acute hyperglycemia is an early and characteristic sign of experimental pancreatic necrosis. This hyperglycemia was not accompanied by glycosuria in the vast majority of cases.

Glycosuria is a most inconstant and fairly rare occurrence, but when found is of extreme diagnostic importance. The presence of hyperglycemia is of great significance and should be investigated in all cases of suspected pancreatitis.

The subacute cases embrace those which present a longer duration and which rarely present an acute course. The patient is often seen in an intoxicated condition due to peritonitis or multiple abscess formation. The presence of an epigastric mass is often noted in this type.

Today we are recognizing cases of acute pancreatitis in which the signs and symptoms and laboratory findings point to that disease, and which are of a still milder form. It is especially in these cases that so often tentative diagnoses are made which are probably correct although not proved by operation or at autopsy.

According to Shingleton,[11] a modified sensitized clotting test has revealed that about one-half of the patients with pancreatic disease have an increase in blood coagulability after pancreatic stimulation. The test may be of some value.

Patients with migratory thrombophlebitis warrant a careful search for an underlying pathologic disorder not infrequently located in the pancreas.

Amylase. One hundred eleven years ago Poyen and Persoz found an enzyme in malt which had the ability of splitting fat. They called this enzyme diastase. Thirteen years later Magendie noted the starch-splitting enzyme in normal blood. Bainbridge and Deddard in 1907 found that depancreatized dogs had a starch-splitting enzyme, which by now was called amylase, still present in the circulating blood. The general consensus among experimenters since that time has been that there is a reduction in serum amylase following the removal of the pancreas in dogs; however, this reduction is only partial, not complete. The normal level is between 70 and 200 (Somogyi) units per 100 cc.

The rise in serum amylase is almost always due to complete or partial obstruction of the main pancreatic duct. In acute pancreatitis the onset of symptoms is accompanied almost simultaneously with a rise in serum amylase. Usually there is an abrupt rise, most often reaching its peak within the first forty-eight hours but sometimes within four to six hours.

There does not seem to be a consistent relationship between the severity of the attack and the degree of amylase elevation. Pancreatic duct ligation in dogs, for instance, can cause marked rises in amylase without any gross or even histologic evidence of structural changes in the pancreas.

The duration of serum amylase elevation seems to have some prognostic value. Transient elevation, which returns to normal or subnormal values within two to three days after the peak has been reached, is thought to be associated with pancreatic edema. In other cases the elevation may persist with a gradual drop in serum amylase over a period of many days. In these cases extensive necrosis of the pancreas may have occurred. However, a precipitous drop is not always a sign of improvement but may mean that extensive necrotic distribution of the pancreas has occurred within a short period of time.

When an amylase level of 150 units or more is associated with acute abdominal pain, the presence of acute pancreatitis should be strongly suspected.

Polowe,[12] in a review of sixty-nine cases, concluded that "Moderate to marked blood amylase activity is invariably associated with disease of the pancreas and that normal or decreased blood amylase activity almost always excludes pancreatitis." He further stated that when pancreatitis exists in conjunction with normal or decreased blood amylase activity it may safely be assumed, if the clinical status of the patient bears it out, that the pancreatitis has subsided or is subsiding.

It should, however, be emphasized that the rise in serum amylase is not confined to acute pancreatitis. An increase usually accompanies inflammatory conditions of the parotid and salivary glands, and less often following the use of codeine and other opiates. Very occasionally an increase may be noted in cases of renal insufficiency, carcinoma of the pancreas and perforated peptic ulcer.

TREATMENT

The conception of the treatment of acute pancreatitis has changed considerably within the past few years and especially after the introduction of the antibiotics. There are still two schools, one quite radical and the other more conservative, during the acute course of the disease. Accept it as true that operative procedure was the treatment of choice ten or fifteen years ago. Even at the present time well balanced articles are appearing which still recommend operation as the procedure of choice.

In 1949 Roads et al.[13] were still adamant for surgical procedures. Going on the premise that the differentiation between the cases with edema and fat necrosis and those with hemorrhagic and necrotizing pancreatitis is not always clear, and working on the hypothesis that all cases of acute pancreatitis are potentially dangerous, they recommended cholecystectomy or drainage of the gallbladder, bearing in mind that many cases of pancreatitis are due to a reflux of bile as a result of stone or spasm, and the blocking of the papilla of Vater in patients having a common channel between the duct of Wirsung and the common bile duct. They believe that operation permits the establishment of drainage tracts for necrotic or infected pancreatic tissue, fluid containing pancreatic enzymes and infected bile. They have found that with the combined rise of operative intervention and a peritonitis regimen (use of antibiotics) postoperatively, the mortality has declined to 3.2 per cent. They conclude that if operation is not performed, no one can be entirely certain whether or not the patient has hemorrhagic pancreatitis unless the patient dies and autopsy is performed. They emphasize this and I quote: "We shall not attempt to specify the present mortality of non operative treatment because there is no way of knowing how many patients not operated upon actually had the disease."

From the University of Philippines, Estrada and Nery[14] first perform cholecystectomy, solving the problem of adequate drainage for infection besides providing another route for bile if for some reason there is obstruction in the common bile duct.

Surgeons from New Orleans, on the other hand, believe that drainage of the pancreas and extrahepatic biliary tract results in a mortality rate of 50 to 80 per cent, and diabetes occurs in 2 to 3 per cent of those who recover. They report thirty patients with the disease treated conservatively, with no deaths.

Whipple[8] in 1948 stated that "The conservative policy was followed in various clinics and lowered the mortality of acute pancreatitis." In Whipple's experience in the past five years mortality was 15 per cent in forty-six cases of

various grades, whereas in two periods (five-year periods) when operation was done as soon as diagnosis was made it was 34 per cent.

As far back as 1942 Lampson[15] reported that in twenty-nine cases of acute pancreatitis seen at the Hartford Hospital the mortality was 33 per cent when immediate operation was performed and 5 per cent when operation was delayed or not performed. Conservative treatment was recommended.

In a most recent article Berk[16] speaks of the management of acute pancreatitis. He emphasizes the utmost importance of the careful observation of patients from the very onset of treatment and that during the early phase of an acute attack the seemingly mild case and the obviously severe one are treated basically alike in the plan of management. He contends that the basic treatment applied in cases of primary acute pancreatitis does not differ significantly from that used in acute recurrences of acute exacerbations of the chronic disease. On the other hand, if full use and guarded application of the various measures have been of no value and the clinical situation fails to improve or becomes more serious because of progressive and spreading peritonitis, unyielding obstructive jaundice, hematoma and acute cystic formation of localized suppuration, surgical intervention may become mandatory. At this time adequate drainage of the lesser peritoneal sac should be provided and external biliary drainage established; more definite corrective proceedings directed at the pancreas or biliary tract are postponed until the acute phase of pancreatitis has subsided.

In evaluating the efficacy of antibiotics in the treatment of acute pancreatitis, Rush and Clifton[17] have found that in conjunction with antibiotic treatment SBI (soybean trypsin inhibitor) specifically counteracts proteolytic activity and shock in acute pancreatitis in dogs and that its potentialities as specific clinical treatment of shock may be considerable.

Miller and Wiper[18] emphasize the importance in the use of the sulfanilamides and penicillin. As an adjunct to the antibiotics Gage and Gillespie[19] suggest the giving of calcium intravenously "in order to neutralize fatty acids and combat spasm of the neuromuscular tubes." They also advocate bilateral block of the splanchnic nerves with 20 to 30 cc. of a 1 per cent solution of procaine hydrochloride to "relieve the obstruction of the ampulla of Vater and eliminate spasm of the ductal and blood vascular systems."

The recent findings of Howard et al.[20] are, I believe, most valuable and should influence our approach in the use of antibiotics in this disease. Their results have been conclusive in establishing these facts, namely, that penicillin, sulfanilamide and sulfadiazine are detected in the pancreatic juice over a twelve-hour period while streptomycin shows slight activity and aureomycin none at all.

TABLE 1

Cases		Died	Per cent
Operative	51	25	49
Non-operative	35	9	25.6
No Operation	35		
No antibiotics	15	6	40
Antibiotics	20	3	15
Operation	51		
No antibiotics	31	17	54.8
Antibiotics	20	8	40

Table 1 shows the mortality rate of operative and non-operative cases, correlated with the use of antibiotics.

CONCLUSIONS

In analyzing the worth of this review it has been necessary to delete all cases which have not been proved by operation, autopsy findings or definite clinical signs and symptoms accompanied by high amylase determination. Even then the writer recognizes that a high amylase might be brought about by varied conditions. Many of the cases reported herein were treated long before the determination of amylase activity was considered as one of the great diagnostic aids; hence those cases were included only because the diagnosis was confirmed either by operation or postmortem.

With the advent of the antibiotics we have quite a different concept of the prognosis and indeed of treatment too. We must, however, recognize the extreme vulnerability of many cases of acute pancreatitis. The presence of glycosuria together with hyperglycemia is certainly of diagnostic importance, but the non-correlation of the two is of such significance that extreme moment should be considered in the presence of hyperglycemia without an accompanying glycosuria. Eighty-four urine

specimens were examined and the findings are of some significance, I believe. Of those, hyperglycemia of over 125 was present with negative glycosuria in fifteen cases.

Of the eighty-six cases reviewed, glycosuria was present in twenty-eight and hyperglycemia in twenty-six.

A considerable difference of opinion has arisen as to when a high amylase should be considered of value. We have followed the dictum of many that 150 should be the minimal rate, and therefore only those cases with an amylase valuation of 150 or more have been considered. Of the fifty cases with amylase determination, thirty-five were over 150.

The signs and symptoms are so well known that little may be added. At least 80 per cent of all the cases noted herein presented acute pain especially referred to the epigastrium and right upper abdominal quadrant, although in the most severe cases acute diffuse abdominal pain was the first symptom. Rigidity is usually present but is as a rule not as marked as in some of the acute abdominal conditions such as perforated gastric ulcer and the like. However, in our experience rigidity is of great diagnostic importance even though in cases of *in extremis* it may not be present.

There is no question but that amylase determinations have been of great advantage to us in diagnosis, and certainly the use of the antibiotics (especially penicillin, sulfanilamide, sulfadiazine and streptomycin) has altered our line of treatment. We must, however, be conscious of the fact that cases will be seen which may demand surgical procedures. Unless you have made a definite diagnosis of acute pancreatitis, it is far better to explore than take the chances of the condition being of another nature. Each case must be considered as a problem and treatment must be carried out in accordance with the surgeon's best judgment. In each and every case presenting pain in the upper quadrants, estimation of the blood sugar and amylase should be obtained. This may be of the greatest diagnostic help.

Recurrent cases have not been included in this report.

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Tuberculosis of the Duodenum

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ALTHOUGH tuberculosis elsewhere in the intestinal tract is not an unusual disease, tuberculous involvement of the duodenum is a rare and interesting lesion. Autopsy records reveal that in persons dying of generalized tuberculosis the duodenum is involved in approximately 1 to 3 per cent.[6,14] Most descriptions of duodenal tuberculosis indicate that it may be found incidental to massive involvement of the rest of the intestinal tract in the terminal stages of the disease. Seldom does the process involve the duodenum alone and still less frequently does such an infection produce local symptoms of duodenal disorder. In an excellent review of the problem in 1932, Matthews, Delaney and Dragstedt[9] could find only six histologically proved cases of tuberculous involvement of the duodenum producing local symptoms. These workers added a seventh case to this series.

In the past twenty years few reports have appeared in the American literature describing duodenal tuberculosis.[11–13] Thus the infrequency of the lesion and the importance of establishing results concerning its surgical treatment appear to warrant the reporting of the following case recently seen at St. Luke's Hospital.

CASE REPORT

The patient, a twenty-seven year old unmarried Negro male, was first admitted to the hospital on August 24, 1954, with a ten-day history of pain in the right lower quadrant of the abdomen associated with nausea and vomiting. The pain had been cramping in nature and there had been frequent diarrheal stools since the onset of the symptoms. Careful questioning of the patient revealed that he had experienced intermittent pain in the right lower abdominal quadrant for a period of at least three years. During the past year, he stated that on several occasions he had had black tarry stools followed by periods of anorexia and "bloating." There had been a weight loss of 40 pounds during the previous twelve months. An annoying flatulence had been experienced for eight to ten months prior to this admission. His past history revealed appendectomy in 1944 and gonorrheal infection in 1949, otherwise the patient had been in good health. Both his parents died in their forties of unknown causes. Physical examination revealed a blood pressure of 120/80, pulse 80, temperature 99.2°F. (rectal) and weight 170 pounds.

The patient, a fairly well nourished Negro adult, did not appear acutely ill but was obviously dehydrated. Physical examination was normal, with the exception of a non-tender palpable liver edge two fingers below the right costal margin, and moderate mixed hemorrhoids. Several shotty lymph glands were felt in the left inguinal region.

Laboratory data revealed the following: red blood count 4,680,000; white blood count 4,050, with 32 per cent lymphocytes, 3 per cent monocytes, 63 per cent neutrophils, 1 per cent basophils and 3 per cent bands. Hematocrit was 42 per cent; sedimentation rate, 31 mm./hour; urinalysis, normal; non-protein nitrogen, 37 mg. per cent; sugar, 89 mg. per cent; sickle cell, negative; heterophil agglutination, negative; and cephalin flocculation, negative.

X-ray of the chest showed healed scars at the right apex which suggested an old tuberculous process. No recent or active pulmonary

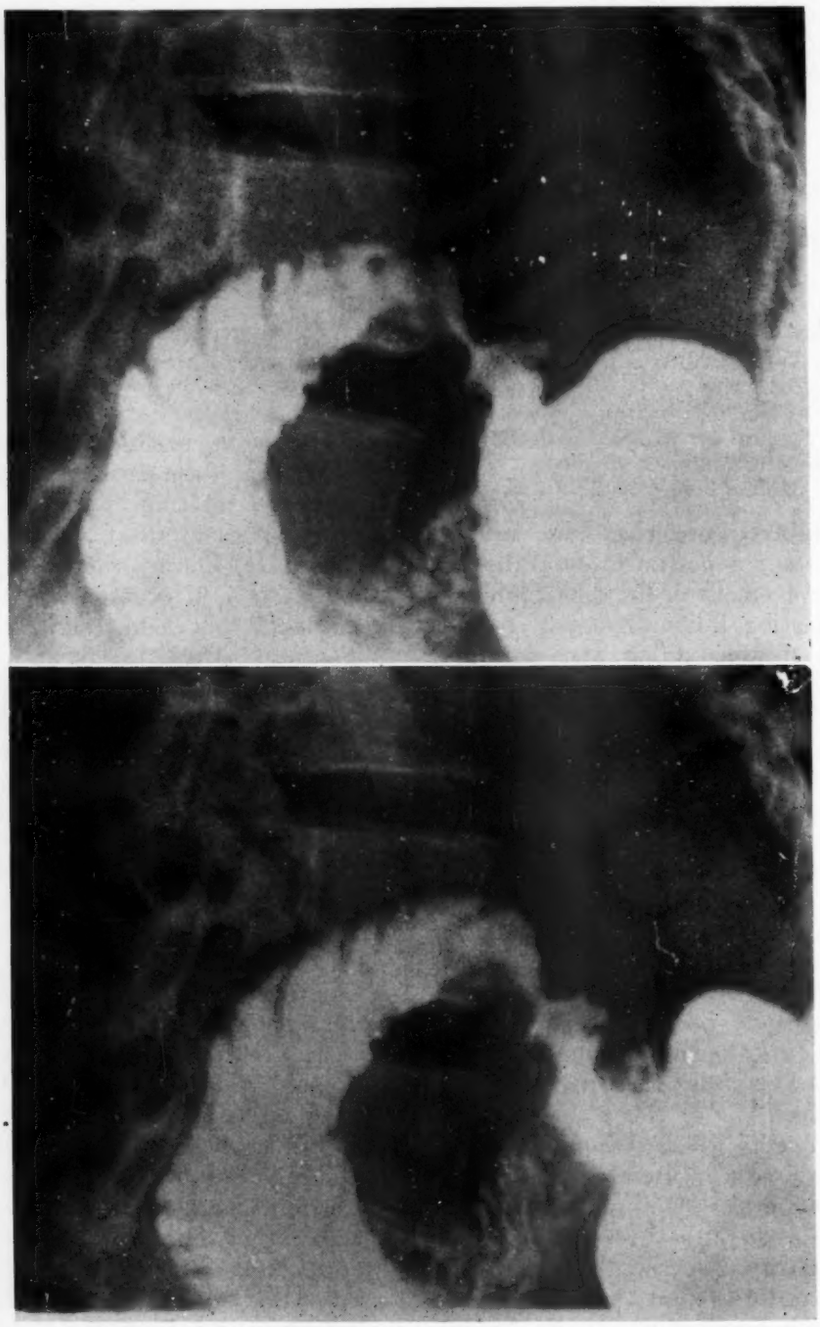


FIG. 1. Preoperative x-rays showing consistent deformity of the duodenal bulb. A diagnosis of duodenal ulcer was made.

disorder was seen. Barium enema was negative. Upper gastrointestinal series revealed a deformed duodenal bulb with evidence of an active ulceration and considerable spasm. The small bowel pattern was normal. Impression was duodenal ulcer. (Fig. 1.)

The patient was placed on ulcer management, and left the hospital five days after admission feeling much improved. Arrangements were made by the medical service to see him on an outpatient basis.

The patient was re-admitted to the hospital four months later, December 31, 1953, stating that pain had recurred shortly after leaving the hospital after his initial admission, and that in the past three days he had been having

severe lower abdominal cramping pain with nausea, vomiting and diarrhea.

Physical examination on admission was essentially the same as on August 24th. The patient was again dehydrated but, with the exception of the palpable liver edge and the presence of mixed hemorrhoids, the examination was negative.

Laboratory work-ups during this hospitalization revealed the following: December 31st: red blood count was 3,810,000; white blood count, 4,950; hemoglobin, 10.2 gm.; hematocrit, 43 per cent; urinalysis, negative; differential count, lymphocytes 22 per cent, monocytes 3 per cent, neutrophils 69 per cent and bands 6 per cent. January 2nd: red blood count was 4,200,000; white blood count 5,400; hemoglobin, 10.8; urinalysis, negative. Proctosigmoidoscopic examination was normal except for internal and external hemorrhoids. Gastric analysis was done which showed a normal acidity curve for free and total acid: non-protein nitrogen was 40.5; cholesterol, 193; sugar, 94; prothrombin, 105 per cent; sedimentation rate, 45 mm./hour; stool, negative for blood; sickling, negative.

The patient was again placed on an intensive ulcer management of antispasmotics and bland frequent feedings, and responded well to the treatment. He remained in the hospital seven days and upon discharge was instructed to return if his symptoms recurred.

On January 18, 1954, twelve days after leaving the hospital, the patient was admitted for the third time stating that since his previous dismissal he had been weak and dizzy, and had shortness of breath most of the time. The evening prior to this admission he had again become nauseated, vomited and experienced severe abdominal pain. Several liquid stools of normal color had been passed the day before admission. Physical examination and laboratory work-up were essentially unchanged since his previous hospitalization.

The patient was placed on ulcer management and evening gastric aspirations were carried out. The volume of these aspirations varied from 40 to 60 cc. of gastric contents with normal acidity. Because of the persistence of symptoms surgery was elected, and on January 27, 1954, laparotomy was carried out. Examination of the abdominal viscera revealed a thickened contracted duodenum adherent to the pancreas posteriorly. The gastrocolic and gastrohepatic ligaments were likewise thickened and edematous and contained many enlarged lymph glands. Several other glands were also palpated along the greater and lesser curvatures of the stomach. The stomach and intestine, however, were normal. A typical gland was resected from the gastrocolic omentum and sent to the laboratory for frozen section. This was reported as reticuloendothelial hyperplasia of the node. A subtotal gastric resection was carried out, but it was with a great deal of difficulty that the duodenum was dissected free of the pancreas. In order to facilitate the dissection the antrum was opened and a finger was placed down through the pyloris into the duodenum. This examining finger encountered a hard, nodular, shelf-like ring approximately ¼ inch distal to the pyloris. (Fig. 2.) This ring admitted only the very tip of the finger and was almost completely obliterating the lumen of the duodenum. Dissection was carried distal to this obstruction and the duodenum was closed beyond it. Approximately 50 to 60 per cent of the stomach was removed.

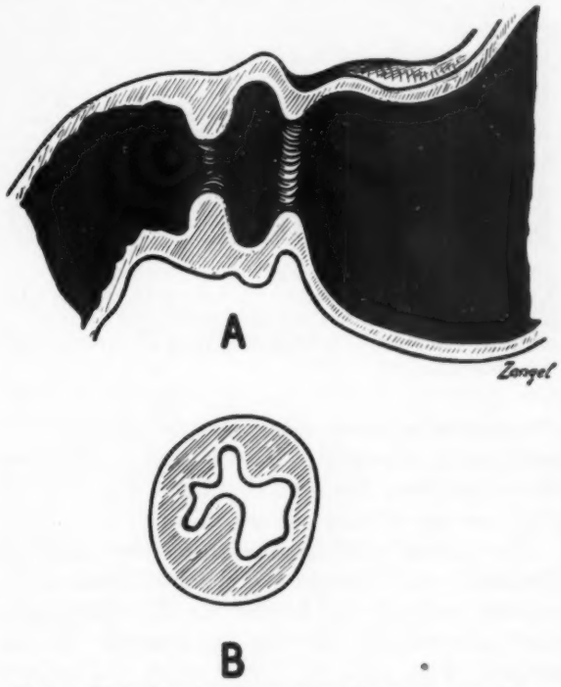
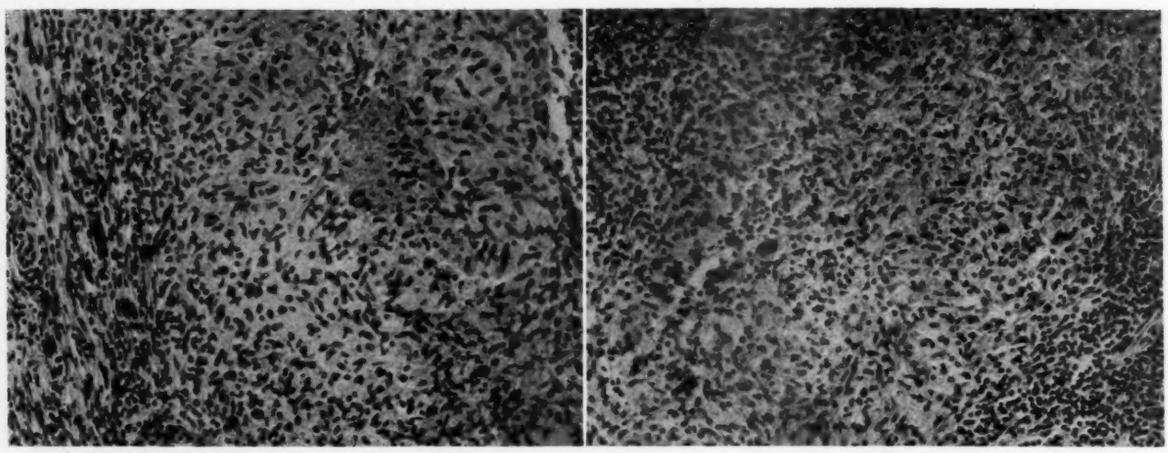


FIG. 2. This drawing illustrates the gross appearance of the specimen in cross section (A) and looking distally beyond the pyloric ring (B).

Postoperatively the patient made an excellent recovery with the exception of a left lower quadrant pneumonia which developed on the sixteenth day. Procaine penicillin and dihydro-



3A 3B

FIG. 3. A, photomicrograph of section taken from the wall of the duodenum showing focal area of tuberculosis infection, with surrounding epithelioid and plasma cells. B, section taken from a lymph gland which shows caseation necrosis and a surrounding zone of chronic granulation tissue with epithelioid cells, supporting stroma and lymphocytes.

streptomycin were administered during the postoperative period. He was discharged from the hospital on the twenty-second day, free of pain, eating well and afebrile.

The pathologic diagnosis on the surgical specimen was "chronic submucosal abscesses—tuberculous—of the duodenum. Chronic caseous tuberculosis of the perigastric lymph nodes." (Fig. 3.)

The patient is now being followed up in the Medical Clinic. When last seen he was gaining weight, was symptom-free and was contemplating marriage. Isonicotinic acid was being employed but the patient refused to submit to parenteral injection of streptomycin.

COMMENTS

Intestinal tuberculosis is generally classified into two main categories: (1) the destructive or ulcerative type and (2) the proliferative or hyperplastic form. The former represents an acute process in which the bacteria pass into the depths of the intestinal glands where an inflammatory process develops. Because of the virulence of the organisms they reach the submucosal layer with a resulting caseation and ulceration into the lumen of the intestinal tract. This is the most common type of intestinal tuberculosis and is seen in approximately 70 to 80 per cent of persons with a massive pulmonary infection who die of the disease.[5,6,8,14] The most common site of involvement is at the ileocecal region and spread may take place in either direction from this point. As the lesion heals, cicatrization develops and obstruction due to stenosis of the bowel lumen or from angulation and retraction on adhesive bands may ensue.

The second form of the disease develops as a proliferative thickening of the wall of the bowel at the point of infection. That ulceration or caseation do not occur is probably the result of either a high resistance on the part of the host, or infection by organisms which are of a low virulence. Instead of inflammation, necrosis and scarring the intestinal wall becomes tremendously thickened by hyperplastic fibrous tissue which produces a granulating and polypoid appearance to the mucosa which grossly may be indistinguishable from a neoplastic process.

The rarity of duodenal involvement by tuberculosis makes it a difficult task to evaluate the clinical manifestations of the disease. However, it has been stated by Melchior[10] and re-emphasized by Matthews and his co-workers[9] that duodenal tuberculosis may present itself in one of three clinical forms: (1) the completely symptomless lesion; (2) lesions discovered incidental to the disease elsewhere in the intestinal tract and giving rise to local symptoms at that point; (3) tuberculous ulceration or scarring with symptoms identical with those of the usual form of duodenal peptic ulcer. This last type is, of course, the one that is of special interest to the surgeon. Because of its infrequent occurrence the lesion is seldom diagnosed

preoperatively. The history, physical examination and x-ray findings indicate obstruction of the duodenum; and when such a process occurs in the first portion of the organ, peptic ulcer is generally thought to be the cause. Indeed, the question of whether or not the infection is introduced into the submucosal area initially through an ulcer is an interesting concept to entertain. The rarity of the disease, however, would certainly exclude this theory as being of primary importance in the development of the infection.

Gross examination at the time of surgery may also be misleading. The thickening, induration and scarring of the duodenum frequently seen in peptic ulcer of long-standing may be identical with that found in a tuberculous infection. Evidence of tuberculous involvement elsewhere in the bowel or the presence of perigastric or periduodenal lymphadenitis may offer support to the suspicion of tuberculosis. Biopsy and frozen section is probably the most accurate method of confirming the diagnosis.

In the case herein presented certain aspects of the history and physical examination should be reviewed with more significance placed upon them than were done in the preoperative period. The x-ray evidence of an old healed pulmonary tuberculous process may have been important. A normal gastric acid titration and the lack of specific upper abdominal pain and tenderness even at the times of acute obstruction should have increased our suspicion as to the etiology of the process. The continued and unremitting evidence of duodenal obstruction despite medical management could certainly be the reflection of an inflammatory process not dependent upon peptic ulceration. A closer evaluation of these factors preoperatively may have allowed a more accurate diagnosis to have been made at the time of surgery.

Of vital importance to the surgeon who faces this problem during the course of an operative procedure for duodenal ulcers is the decision as to which procedure will relieve the patient of his obstruction and yet be associated with the least hazard to the patient's life. A number of reports have appeared in the literature concerning gastric tuberculosis and the surgical treatment of this disease.[1,4,15] As far back as 1931 Good[7] reviewed twenty-four cases of patients with tuberculosis of the stomach who underwent surgery, with a mortality rate of 21 per cent. An analysis of the case reports since that time indicate that this figure has not been altered a great deal. Chaffin[2] has summarized the principle of surgery for gastric tuberculosis by stating that, "The strength of the patient and the extent of the gastric lesion guide the surgeon in the type of operation he selects. Obviously, the more radical the resection, the greater likelihood of eliminating the disease from the stomach." There is no reason why such reasoning should not apply to a tuberculous lesion in the duodenum.

Of the four cases reported in the American literature since 1932, three of the patients underwent surgery. The fourth case was diagnosed at autopsy following perforation of a duodenal ulcer and death.[13] In the case presented by Matthews, the patient underwent resection of the antral area of the stomach and first portion of the duodenum for a lesion just distal to the pyloris. Intestinal continuity was re-established by a Polya type gastroenterostomy. A lung abscess developed shortly after surgery and the patient expired approximately seven weeks following the operation. In 1945 Ostrum and Serber[12] reported a case of a patient who was operated upon for duodenal peptic ulcer which proved to be tuberculosis of the duodenum. Gastric resection was carried out for this lesion which was present in the first portion of the duodenum. Postoperatively an abdominal fistula developed and the patient expired approximately six and a half weeks following surgery for duodenal perforation due to tuberculous ulceration. In 1943 Migliaccio[11] operated upon a patient with a narrowing and irregularity of the third portion of the duodenum. The preoperative diagnosis was carcinoma. At laparotomy, however, a soft mass could be felt in the third portion of that organ and frozen section of a nearby gland revealed tuberculosis. Local resection with end-to-end anastomosis was carried out and the patient was alive and well a year after surgery.

The patient in the case herein reported underwent surgery without our certain knowledge that we were dealing with a tuberculous process. The duodenal stump was closed at a level where infection was seen histologically and healed primarily without leakage or abscess formation. Perhaps this fact is attributable to the postoperative use of dihydrostreptomycin for twenty-two days following surgery and the administration of isonicotinic for approximately nine weeks following release from the hospital.

CONCLUSION

A case of tuberculosis of the duodenum is presented. This unusual and interesting lesion is difficult to differentiate from duodenal peptic ulcer. A brief discussion of some of the salient characteristics of the disease is given.

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Presacral Neurectomy

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While approximately 50 per cent of women suffer from dysmenorrhea of varying degrees and severity, it usually occurs in the absence of any pelvic lesion; and when such abnormal conditions do exist, care must be taken to evaluate their part in the production of the menstrual pain. For example, uterine suspension and the resection of simple follicular cysts often fail to bring about the desired symptomatic relief.[1] However, there is one relatively simple operative procedure virtually devoid of complications that can produce excellent results in well selected cases; this is the so-called presacral neurectomy. The failures lie in those patients whose dysmenorrhea originates purely in the psychologic levels, as seen in patients who resent their feminine role, are physically immature, or are chronically anxious or chronic complainers.[2]

The operation itself is not new, having been performed first in 1898 by Jaboulay and in 1924 by Cott,[3] who sectioned the superior hypogastric plexus with good results. Since then the operation has been performed many times. In 1945 Marshall and Kennedy[4] reported 100 consecutive cases with 90 per cent complete relief of all menstrual symptoms in primary dysmenorrhea, and 80 per cent in patients with secondary dysmenorrhea. Henricksen[5] reported 73 per cent cured in primary dysmenorrhea. In addition to these workers other interested surgeons such as Counseller and Craig,[6] Keene,[7] Rutherford,[8] Meigs[9] and Te Linde[10] have spent considerable time in evaluating this procedure. Interestingly enough, while all of these authors admit to the effectiveness of a presacral neurectomy and concur that it causes no physiologic changes in the pelvis, they insist that it should be used only in those cases which have defied other measures.

It is the purpose of this paper to point out that in general this is a neglected operation which could be used more freely as an entity in itself, or in conjunction with other operative procedures for the relief of dysmenorrhea. Most patients with menstrual pain are tolerant with their monthly discomfort inasmuch as it has long been assumed to be the customary and usual thing. However, when the discomfort requires repeated strong sedation and enforced bedrest, the tolerant attitude begins to disappear and a more aggressive approach becomes necessary. If it can be considered worth while to suspend a uterus, resect an ovary or remove a chronically inflamed appendix in an effort to alleviate the patient's symptoms, then it is certainly worth while to give her the benefit of a presacral neurectomy.

Almost all of the surgeons who have contributed their time, knowledge and technical skill to this problem urge that the case be selected with care. Unfortunately unless some definite criteria can be laid down or some working plan formulated, little help can be given the individual surgeon who lacks the clinical material or superior knowledge possessed by these operators.

To "select with care" may mean to some surgeons months and perhaps years of careful screening. To others it may mean the selection of patients whose pain and monthly distress seems genuine and yet who fail to respond to their usual dysmenorrhea therapy.

In an effort to be more practical in the proper selection of cases, two tests are useful in excluding those patients whose complaints lie in the psychiatric fields. One is the use of sodium amytal intravenously at the time of the menstrual pain to differentiate pain of emotional origin from pain of organic origin. The test is simplicity itself. Sodium amytal, 3¾ gr., is dissolved in 5 cc. of distilled water and given slowly intravenously at a rate of 1 cc. per minute. At the end of three minutes the needle is withdrawn and the patient is asked the extent of her pain. Complete relief of her pain indicates that the dysmenorrhea is emotional in origin and the case is not suitable for presacral neurectomy.

The second test consists of the administration of estrogen to inhibit ovulation, thereby producing an anovulatory cycle which is pain-

less. This type of patient will have excellent results from presacral neurectomy.[11]

In the case reports to follow, either one test or the other has been used to demonstrate whether or not good results could be expected from neurectomy. On such a basis the results have been uniformly 100 per cent satisfactory.

The anatomy of the presacral region looks formidable in print but not nearly so in actual dissection. It is pointless to try and remember the multiple ramifications and variations of this aspect of neurology. Our concern is with the structure below the bifurcation of the aorta where the intermesenteric nerves join to form the superior hypogastric plexus of the presacral nerve. The fibers continue caudally in front of the sacral promontory to form the middle hypogastric plexus and then divide to form the bilateral inferior hypogastric plexus at about the level of the first and second sacral processes.

It must be remembered that the nerve fibers which supply the ovary originate from the renal and aortic plexuses, not from the sacral ganglia or nerves. Therefore, any interruption of the presacral nerve will not affect ovarian pain.

TECHNIC

Most textbooks advise the removal of the entire presacral plexus from 2 to 3 cm. above the bifurcation of the aorta caudal to the bifurcation of the common iliacs.[12] However, in the simplification of technic herein reported such high dissection is not deemed necessary nor is such a wide dissection needed, as described by Curtis,[13] in which both ureters are taped and retracted. Although Curtis agrees that the importance of high dissection appears overemphasized, he urges wide and thorough dissection below.

The patient is prepared for surgery in the accustomed manner, only unlike most other operations, an enema is ordered the night before in order to facilitate retraction of the rectosigmoid for adequate exposure.

Either the usual gynecologic infraumbilical incision is used or the Pfannenstiel incision can be used, although this may necessitate an extra assistant to aid in exposure. The contents of the pelvis are explored, and any abnormality is noted for correction following the completion of the neurectomy. The intestines are walled off and the sigmoid retracted to the left. The posterior peritoneum is incised over the sacral promontory extending from the bifurcation of the aorta to the brim of the pelvis. The peritoneal flaps are dissected laterally and retracted by means of six heavy black silk sutures, three on either side.

The presacral plexus can be identified as a tough structure lying within the delicate connective tissue above the bony posterior wall. The plexus can be grasped by long Allis forceps and the fibers delineated by blunt dissection with a small gauze sponge. In this way the right ureter can be readily visualized; the left does not have to be seen. The superior hypogastric plexus lying immediately beneath the bifurcation of the aorta can be identified. By means of McKenzie small silver clips, hemostasis can be readily achieved and the plexus divided at this level. Once this portion of the plexus is freed it becomes a simple matter to dissect downward by combined blunt and sharp dissection to where the fibers of the middle hypogastric plexus divide to form the bilateral inferior hypogastric plexus. Clips are placed on these fibers and the divided plexus removed in one piece.

The posterior parietal peritoneum is closed and any remaining indicated pelvic procedure is carried out. A retrodisplaced uterus is usually suspended not from fear of adhesions as expressed by Cotte, but because it is difficult to convince a patient with menstrual pain of the insignificance of her "tipped womb." Mayer[14] has pointed out the unimportance of a uterine retroflexion, except as an obstacle in therapy, in that it acts as a countersuggestion when another physician with an impressive mien speaks to a patient of the "tip." In any event it takes but a few minutes to suspend the uterus and make the patient happy.

Postoperatively a Foley catheter is left in the bladder for two days and then withdrawn. The much heralded inability to urinate has not been seen in these presacral neurectomies.

As can be noted, the operation is a simple one with virtually no mortality. However, it is associated with the same complications of any other laparotomy under spinal or general anesthesia. There is likewise no interference with the libido or the ability to become pregnant or deliver normally, other than the fact that labor is not too painful as a rule. There is no alteration in normal physiology of the reproductive organs. Some patients will report a

much heavier flow than usual for a few periods, but as a rule this is a minor disturbance that patients will tolerate in the absence of pelvic pain. The chief difficulty that most patients complain about is the occasional social embarrassment caused by the appearance of the menstrual flow without warning.

CASE REPORTS

CASE I. P. R., an unmarried sixteen year old girl, was admitted on April 16, 1954, for surgical treatment of severe menstrual pain controlled only by producing anovulatory periods. Her past history was significant in that she had had rheumatic fever at twelve years of age and a ruptured ovarian cyst removed at fifteen years of age. This partial oophorectomy had not alleviated her distress. Pelvic laparotomy through a Pfannenstiel incision revealed a large left ovarian follicular cyst measuring 10 cm. in diameter with a 1.5 cm. remnant of the right ovary. The cyst was resected and presacral neurectomy performed.

CASE II. P. J., a single sixteen year old girl, was admitted on December 2, 1952, because of repeated attacks of lower right-sided abdominal pain with nausea. In addition the patient suffered from severe dysmenorrhea, requiring bedrest for at least two days. The patient was emotionally immature with a chronic anxiety tension state and refused to allow a pelvic or rectal examination. Sodium amytal intravenously did not ameliorate her menstrual discomfort but did eliminate the tension symptoms. A pelvic laparotomy revealed normal reproductive organs and an appendix bound down with multiple adhesions. Presacral neurectomy and appendectomy were performed.

CASE III. M. M., a single seventeen year old girl, was admitted on February 22, 1954, for surgical treatment of severe menstrual pain which began with her first period four years previously. This had been controlled for the past three years (for every two of three months) by producing anovulatory periods with stilbestrol. Surgery had been delayed because of her family's attitude toward "interference with nature." Finally the child was sent home from school in such agony during one of her untreated periods that the family relented and permitted hospitalization. Pelvic laparotomy revealed no abnormalities of the reproductive organs or appendix. Presacral neurectomy and appendectomy were performed.

CASE IV. S. M., an unmarried eighteen year old girl, was admitted on June 5, 1953, because of severe abdominal cramps with each menstrual period which required twenty-four hours of bedrest. Anovulatory periods by means of stilbestrol were always painless. Pelvic laparotomy revealed normal findings. Presacral neurectomy and appendectomy were performed.

CASE V. C. O., an unmarried nineteen year old girl, was admitted on March 28, 1954, for relief of menstrual pain which for the past six years had been becoming progressively worse. The pains were described as severe "labor-like with clots" (the patient's mother was a graduate nurse) which lasted for the entire seven days. Sodium amytal by vein failed to relieve the symptoms. An appendectomy had been performed at ten years of age. Pelvic exploration revealed a small, sharply retroflexed uterus with a prolapsed left ovary in the cul-de-sac. The right ovary was three times its normal size and contained multiple retention cysts with a recently ruptured corpus luteum. There were no adhesions. A presacral neurectomy followed by a uterine suspension was performed.

CASE VI. J. H., a married twenty-three year old woman, was admitted on March 3, 1953, for relief of severe menstrual cramps which appeared with her first period at the age of thirteen and had been unrelieved by the birth of her only child when she was nineteen years of age. Use of stilbestrol had produced painless menstrual periods. At operation dilatation and curettage followed by conization of the cervix was performed because of a badly eroded cervix. Through an abdominal approach presacral neurectomy, uterine suspension and appendectomy were performed.

CASE VII. J. K., a twenty-four year old married woman, was admitted on November 3, 1952, for surgical relief of persistent life-time dysmenorrhea which had been unrelieved by any medical treatment throughout her fourteen years of discomfort. Anovulatory technic resulted in painless periods. An eroded cervix was conized and presacral neurectomy and appendectomy were performed on normal pelvic organs.

CASE VIII. F. M., a married twenty-five year old woman, was admitted on January 23, 1952, because of persistent painful menstrua-

tion which in the past few months had become so severe that bedrest and strong sedation were required for relief. This pain persisted for three of the seven days and was unrelieved by sodium amytal intravenously. At operation a markedly retroverted uterus containing a small subserous fibroid on the anterior surface was found with a right ovarian cyst measuring 4 cm. in diameter. The appendix had been previously removed. Presacral neurectomy, partial right oophorectomy, myomectomy and utèrine suspension were performed.

Case ix. P. M., an unmarried twenty-seven year old woman, was admitted on January 22, 1952, for a presacral neurectomy in an effort to control her persistent and prolonged menstrual pain that had begun with her first menstrual period thirteen years previously. Anovulatory periods were painless. Pelvic laparotomy revealed a retroverted uterus with a small fibroid measuring 2 cm. in diameter on the fundus. Both tubes and ovaries were normal. The appendix had been removed. Presacral neurectomy with myomectomy and uterine suspension was performed.

Case x. M. C., a twenty-nine year old married woman, was admitted for operative treatment of pelvic pain and severe intractable dysmenorrhea that had failed to respond to two previous surgical procedures or sodium amytal by vein. The first operation was a partial oophorectomy with appendectomy in 1942. The second was a uterine suspension and partial oophorectomy in 1947. Surgical exploration of the pelvis revealed numerous adhesions of the omentum to the sigmoid and original incisions. The left ovary could not be found and the right ovary was 5 cm. in diameter and contained multiple cysts. The uterus was retroverted despite the history of a previous suspension. The adhesions were severed and the uterus suspended after presacral neurectomy was performed.

Case xi. F. H., a thirty-one year old married woman, was admitted for surgical relief of severe dysmenorrhea despite repeated dilatation and curettage. Anovulatory periods produced by stilbestrol produced painless periods. At operation a normal-sized uterus, tubes and right ovary were found. The left ovary concontained numerous cysts and was covered by tiny areas of endometriosis, as was the anterior surface of the uterus and the bladder. The appendix had been previously removed and the omentum was fastened to the original incision. The adhesions were severed by sharp dissection; partial left oophorectomy and presacral neurectomy were performed.

Case xii. D. M., a thirty-three year old married woman, was admitted on May 20, 1952, complaining of frequent prolonged menstrual periods, each lasting from ten to twelve days, with severe abdominal pain and terrible nausea of six months' duration. The patient's complaints began after her "miscarriage" in 1946 and were unrelieved by sodium amytal. Pelvic laparotomy revealed both ovaries to be four times normal size, the results of retention cysts. Dilatation and curettage followed by presacral neurectomy, bilateral partial oophorectomy and appendectomy were performed.

Case xiii. E. R., a married thirty-four year old woman, was admitted on April 8, 1954, for surgical relief of intractable menstrual pain of twenty years duration relieved only by producing anovulatory periods. The patient was emotionally unstable, having attempted suicide in 1946 by barbiturates, yet sodium amytal would not alleviate her pelvic distress. Operation revealed a mass of adhesions from a previous appendectomy at ten years of age. The uterus was retroflexed while the tubes and ovaries were normal. Lysis of adhesions with presacral neurectomy and uterine suspension were performed.

Case xiv. R. R., a married thirty-five year old woman, was admitted following a routine examination when a gold stem pessary was removed which the patient had worn for the last eight years in an effort to relieve her severe dysmenorrhea. The patient had been given sodium amytal by vein at home and the failure of relief resulted in the examination of the patient in the office a month later. The cervical canal was badly eroded but the rest of the reproductive organs were normal. Dilatation and curettage followed by conization of the cervix with presacral neurectomy and appendectomy were performed.

Case xv. A. W., a married thirty-nine year old woman, was admitted for surgical treatment of extreme agonizing menstrual pain for the first six to seven hours followed by severe pain for several days. This condition had continued unabated except for several recent periods when anovulatory periods were produced. On pelvic exploration the left tube and ovary were missing, as was the appendix.

These had been removed at operation when the patient was sixteen years of age. Presacral neurectomy was performed.

SUMMARY

Presacral neurectomy is an often neglected method of alleviating dysmenorrhea which will give uniformly excellent results in selected cases. The selection of suitable cases can be removed from the realm of speculation as to the outcome by testing the patient beforehand by either intravenous sodium amytal or by producing an anovulatory period. Reports of fifteen patients completely relieved of all menstrual complaints by this type of surgery are included.

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Hematoma of Rectus Sheath

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HEMATOMA of the rectus sheath is not infrequent nowadays, and the condition is more often diagnosed preoperatively.

The case of a hematoma occurring in the upper part of the rectus sheath is reported herein because of its interesting diagnostic problem.

CASE REPORT

A sixty-three year old woman was admitted to the Southport General Infirmary on January 1, 1953. She complained of acute abdominal pain, generalized at first and later settling in the left hypochondrium, of one day's duration. She thought that the pain had come on as a result of coughing and stated that she suffered from a chronic cough. At 11 A.M., prior to admission, she vomited greenish mucoid fluid. Her bowel action was regular and she had slight dysuria. Her past history revealed she had two healthy children and her menopause was in 1945.

Examination revealed an obese woman in obvious pain. Chest examination showed no cardiac abnormality; a few crepitations were audible at the base of both lungs. Abdominal examination revealed an obese abdominal wall which moved normally on respiration. A very tender mass was palpable in the left hypochondrium about 4 inches (10 cm.) below the costal margin and 1 inch (2.5 cm.) from the midline. It was possible to get above its upper margin and below the costal margin. Rectal examination revealed no abnormalities. Vaginal examination showed that the patient had a lipoma below the left labium majus and slight rectocele and cystocele.

Blood pressure was 180/90, pulse 88 and temperature 99.2°F.

A provisional diagnosis of torsion of the omentum or pancreatic cyst was made and it was decided to keep the patient under observation. During the course of the next two days the mass became less tender and more defined.

Laboratory data revealed the following: Routine examination of the urine was normal. The volume of urine was 440 ml. in twenty-four hours; urinary diastase 10 units/ml 4,400/twenty-four hours, normal; serum amylase 123 units per cent. Blood count: Hemoglobin 12.6 gm. per cent; red blood cells 4.22 million; color index 1; white blood cells 6,800; blood group B, Rh positive.

X-rays were taken on January 3, 1953, and reported as follows: There was no evidence of disease of lungs and pleura; slight calcification was seen in walls of the arch of the aorta. Straight x-ray of the abdomen revealed a shadow on the left side of the abdomen just above the iliac crest situated anteriorly (? mesenteric cyst). Both renal shadows were shown, not appreciably large or displaced. There were no urinary stones. Chronic osteoarthritis of the lower lumbar vertebrae was found.

Barium meal: The opaque solution passed through the pharynx and esophagus without obstruction into the stomach. There was evidence of a small paraesophageal hernia and regurgitation of opaque solution into the esophagus on inversion of the patient. There was no evidence of any organic disease of the stomach and first part of the duodenum.

The opaque solution passed through the jejunum. The rounded tumor lay in the left side of the abdomen anteriorly, and proximal loops of jejunum appeared to surround the tumor partially. (Figs. 1 and 2.) The stomach emptied satisfactorily; there was no evidence of any small or large bowel obstruction. The appearances suggested the tumor was a mesenteric cyst

At operation, performed on January 12, 1953, a left paramedian incision was made. The tumor was found to be a hematoma in substance of left rectus muscle between the two layers of its sheath. The peritoneal cavity was opened and explored but no lesion was found. The wound was closed with drainage of the abdominal wall.

COMMENTS

The condition of hematoma of the rectus sheath more commonly affects the lower part

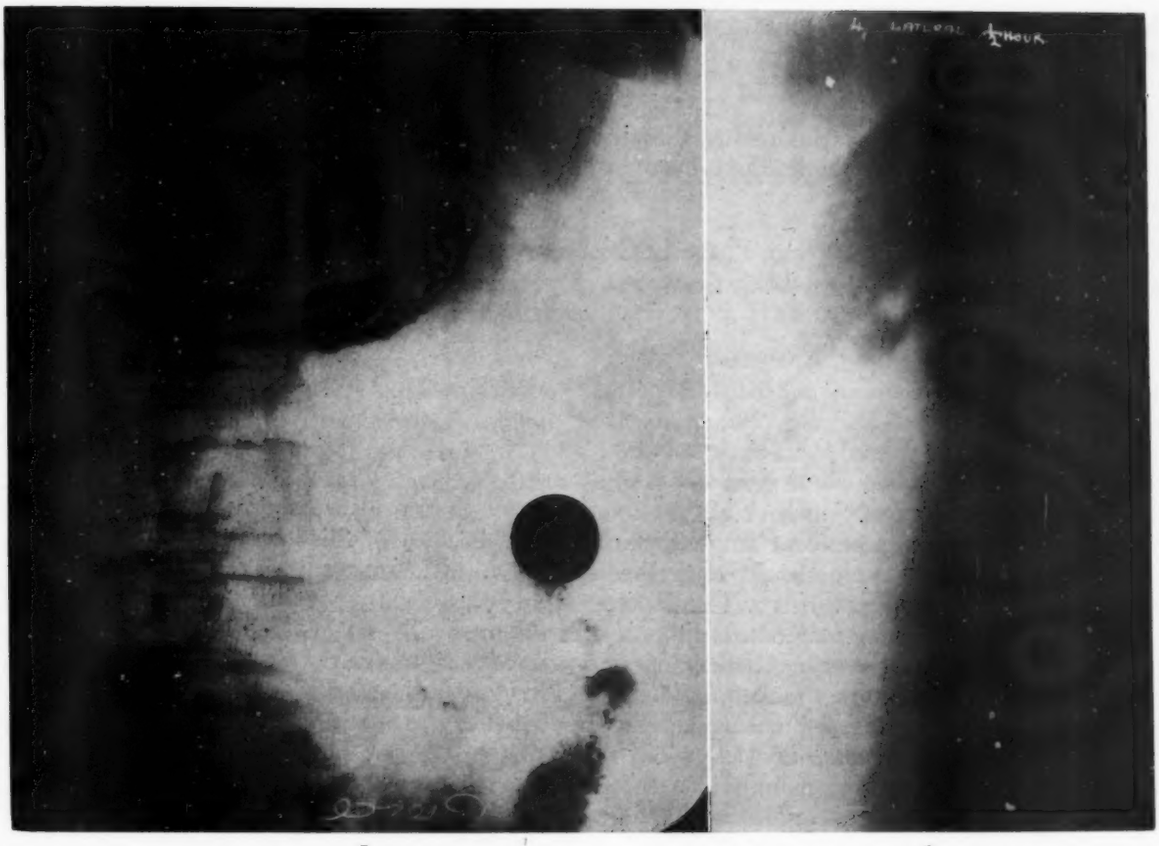

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FIG. 1. Barium meal showing circumscribed mass partially surrounded by jejunum.

FIG. 2. Lateral view showing circumscribed mass lying anteriorly and partially surrounded by jejunum.

of the rectus and more so on the right side than the left. It is usually mistaken for acute appendicitis.

The interesting points in the case reported are its occurrence in the upper half of the left rectus, the difficulty in arriving at a diagnosis and the interesting radiographs suggesting a mesenteric cyst as the possible diagnosis.

The cause of the rupture would undoubtedly appear to be due to a severe bout of coughing, as the patient stated on admission. The persistent cough resulted in rupture of her vessel, predisposed to by atheroma, in view of the radiologic evidence of calcification in her aorta.

Aird[1] states that some 150 cases of ruptured epigastric vessels have been reported in the literature, and quotes Beals[5] as describing its occurrence in 8 of 140 fatal bronchopneumonics.

The condition has also been described as occurring in hemophilia, scurvy, leukemia, infectious fevers and debilitating diseases, and in men undergoing unaccustomed severe exercise.

Knaak reports cases occurring in young army recruits following unaccustomed exercise. In these, twenty occurred in the upper part of the rectus abdominis. Stoeckel[3] reports two cases, one in a woman six months pregnant who experienced pain in the right lower quadrant of the abdomen following a severe bout of coughing, and the second case in a pregnant woman eight days before full term, who experienced pain in the right upper quadrant of the abdomen. When seen by the midwife she was found to have a swelling which, following the birth of the baby, was thought by the midwife to be the head of a twin.

Ehrenfest, in a personal communication to Wohlgemuth,[2] describes a case of a woman, who developed a tumor the size of a football in the right lower abdomen after a severe bout of coughing which lasted some three days. It was thought to be an ovarian tumor, but at operation proved to be a ruptured rectus.

Treatment may be either conservative or operative, but is more usually the latter prob-

ably because the condition simulates so many intraperitoneal lesions.

SUMMARY

A case of hematoma of the rectus sheath which simulated an intra-abdominal cyst is presented.

Acknowledgment: I wish to thank Mr. T. C. A. Burgess for permission to publish this case.

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Studies of Smith et al. on 1,000 cases of gastric ulcer show that not more than 10 per cent are malignant. Hence, because of this low incidence of malignancy, medical therapy has as good an ultimate result in the average case as has surgery. The postoperative surgical patient who is proven to have a non-malignant ulcer is treated medically anyway. Therefore Smith and co-workers believe one month's intensive medical therapy may safely be tried on the vast majority of gastric ulcers instead of recommending surgery at once, as was done in about half of the aforementioned cases. (*Richard A. Leonardo, M.D.*)

The Problem of Tumor Simulating Hypertrophic Gastritis

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TUMOR simulating hypertrophic gastritis, although rare, presents definite problems in diagnosis and treatment. Often carcinoma of the stomach cannot be differentiated from localized hypertrophic gastritis even with the combined help of x-ray, gastric washings and gastroscopy. Should a definite diagnosis of hypertrophic gastritis be made either clinically or during surgery, the problem of what to do surgically, if anything, always arises. We have carefully and analytically reviewed the literature in an attempt to answer the problems which hypertrophic gastritis presents. Our conclusions follow.

Every attempt should be made to establish a clinical diagnosis. A careful history and physical examination, as well as repeated radiologic studies, gastric washings and gastroscopy with biopsy, should be carried out. If carcinoma cannot be ruled out, exploratory laparotomy with gastrotomy and a generous biopsy are indicated.

In reviewing and analyzing the literature and studying all available case reports, three factors have determined the actual treatment of hypertrophic gastritis. They were (1) its malignant potentiality, (2) the severity of symptoms and (3) the age and general condition of the patient.

The malignant potentiality of hypertrophic gastritis is subject to much controversy. Many authors state or imply that its presence constitutes an indication for excisional surgery.[1,3,8,14,15,18] Others believe there is no relationship between carcinoma of the stomach and tumor simulating gastritis.[5,6,7,9] In reviewing the literature and analyzing the cases there are approximately sixty-one patients in whom a diagnosis of hypertrophic gastritis was made and substantiated by biopsy, surgical specimen or autopsy.[2 5,7,8,10,12,14–16,18]

Our patient makes the sixty-second substantiated case since Mentier's original description in 1888. Of these sixty-two patients with hypertrophic gastritis only one had associated carcinoma of the stomach.[14] This is an incidence of correlation of 1.5 per cent. If we reverse the preceding statement we can say that of all the gastric carcinomas we have seen, there was never associated hypertrophic gastritis, either localized or diffuse. The mucosa was either normal or atrophic. Therefore, we believe that on the basis of available evidence and biostatistical analysis any association between gastric carcinoma and tumor simulating hypertrophic gastritis is coincidental. The latter is not a premalignant entity and therefore does not constitute an indication for surgery.

With malignant potentiality eliminated as an indication for surgery in tumor simulating hypertrophic gastritis, the question then arises: When is surgery indicated in this disease entity? Most of the patients with hypertrophic gastritis have symptoms which vary from mild dyspepsia to severe abdominal pain. They may include weight loss, severe anorexia, malaise and severe gastric hemorrhage. Signs and symptoms secondary to hypoproteinemia may be present. The majority (80 per cent) of these signs and symptoms will respond to intensive medical management, as shown in a careful review of the available case reports.

CASE REPORT

W. M., a fifty-five year old white man, was admitted to Madigan Army Hospital on July 13, 1953, with a one-month history of anorexia, night sweats and cough. There had been a 15 pound weight loss in three months. Physical examination revealed a well developed, well nourished white man who did not appear chronically ill. No other physical findings were noted. The patient had a normal complete blood count and normal liver function tests. There was no occult blood on stool examina-

FIG. 1. Filling defects are present on the greater curvature throughout the fundus and the body. The thickening between the fundus and the diaphragm suggests gastric carcinoma.

FIG. 2. Section of stomach showing the pseudopolypoid appearance resulting from alternate areas of hyperplasia and atrophy with cystic changes at the bases of the glands. (Armed Forces Institute of Pathology, Washington, D. C.)

tion. Mild hypoproteinemia was present. Chest x-ray was negative. Gastrointestinal series revealed marked filling defects throughout the fundus and body of the stomach with slight irregularity of the antral mucosa. There was thickening between the fundus and diaphragm highly suggestive of gastric carcinoma. The remainder of the radiologic examination was compatible with hypertrophic gastritis. (Fig. 1.)

Gastroscopy without biopsy revealed hypertrophic gastritis, but carcinoma or lymphoma could not be ruled out. Gastric washings were negative for tumor cells. The patient was presented to the Tumor Board which recommended exploratory laparotomy with definitive surgery to be based on the histologic examination of a gastric biopsy. On August 18, 1953, under gas-oxygen-ether endotracheal anesthesia an exploratory laparotomy was performed. The stomach wall was thickened and on palpation felt like a "bag of worms." No localized lesion was present. Gastrotomy revealed a cobblestone-like mucosa. A generous biopsy was reported as benign on frozen section. No further surgery was indicated. An operative diagnosis of tumor simulating hypertrophic gastritis was made. The patient's postoperative course was uncomplicated. Repeat gastroscopy showed no change. The patient was represented to the Tumor Board which recommended return to duty, since the patient's hypertrophic gastritis was not considered a premalignant entity and symptoms were minimal and responding to a medical regimen.

The pathologic report on August 20th stated that the specimen consisted of a segment of stomach measuring 3.5 by 2.5 m. The rugae were prominent and pale. The submucosa was areolar and edematous. On microscopic examination the glands were lined with chief and parietal cells in their usual ratio and distribution. Within the deeper portion of the mucosa the glands were cystic and lined entirely with mucus-secreting cells. These cystic glands extended through the muscularis mucosae into the submucosa. The lamina propria was edematous. The infiltrate in this region consisted principally of plasma cells, although a moderate number of eosinophils and lymphocytes were also present. In areas where the surface dipped deep into the mucosa small ulcerations were noted. This was characteristic of the lesion and accounted for the pseudo-

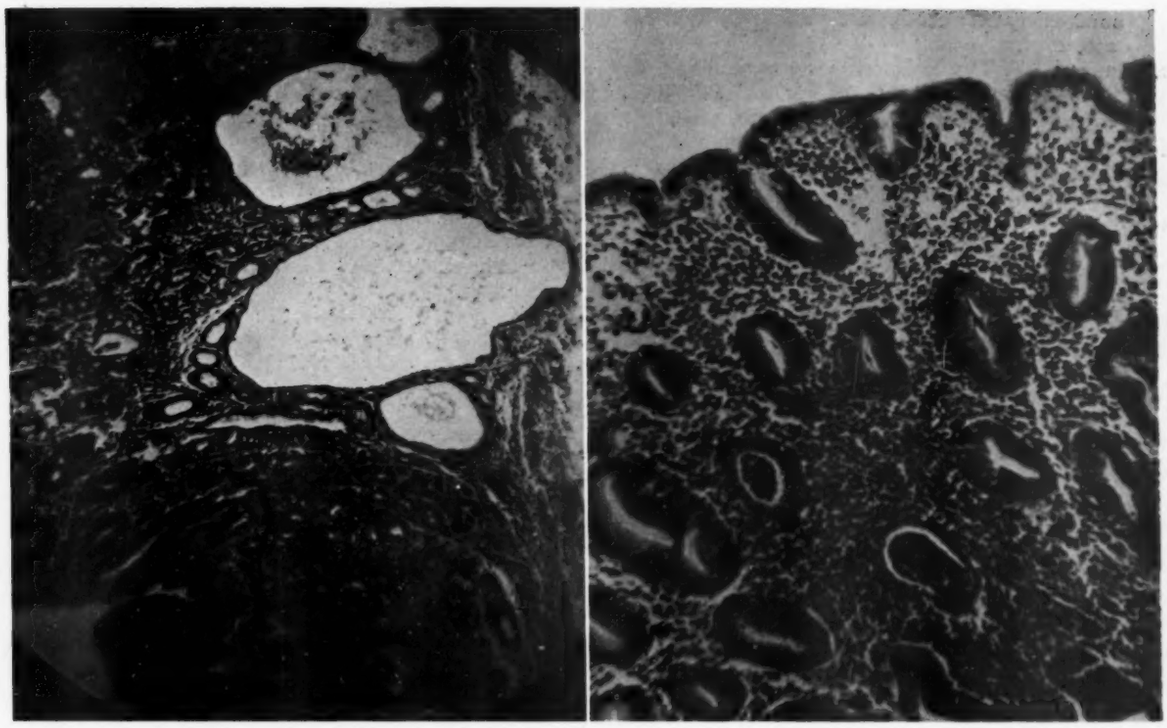

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FIG. 3. The cystic gland in the center is extending through the muscularis mucosa. There is a diffuse infiltration of round cells throughout the submucosa. (Armed Forces Institute of Pathology, Washington, D. C.)

FIG. 4. The superficial portion of a gland showing exudate within the lumen and degeneration of the epithelial lining. (Armed Forces Institute of Pathology, Washington, D. C.)

polypoid appearance noted by x-ray and on gross examination. There was a diffuse round cell infiltration in the muscularis mucosa, submucosa and muscularis. (Figs. 2, 3 and 4.) The final pathologic diagnosis was hypertrophic gastritis.

SUMMARY

Every attempt should be made to differentiate tumor simulating hypertrophic gastritis from carcinoma of the stomach clinically or, if necessary, by exploratory laparotomy with biopsy. On the basis of available statistical evidence tumor simulating hypertrophic gastritis is not a proven premalignant lesion. The majority of symptoms in this disease entity will respond to medical management. Therefore, there are only a very few patients in whom gastrectomy is indicated.

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Cystadenoma of the Pancreas

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CYSTADENOMA of the pancreas is a well encapsulated multicystic tumor which usually arises from the body or tail of the pancreas. Malignancy is quite common. There are about half as many cystadenocarcinomas as cystadenomas.[3,13] At times it is difficult to distinguish the benign tumor from one of low grade malignancy. Papillary projections of the lining epithelium are not enough to call the tumor malignant; other evidence is necessary. The presence of mucin between the connective tissue fibers is regarded by some as an indication of malignancy.

Bravo[3] classifies cystadenoma into three groups: (1) those lined with columnar epithelium; (2) those lined with cuboidal epithelium; (3) those lined with epithelium resembling that of the intestine which is similar to that of the enterogenous type of mesenteric cyst.

Many concepts have been offered to explain the origin of this tumor. It has been attributed to a proliferation of the small ducts following a retention of secretion[15] or to a growth arising in aberrant pancreas, or to a growth of primitive cells from a misplaced segment of the urogenital fold.[16] Trauma and inflammation do not apparently account for the formation of cystadenomas of the pancreas.

An unusual feature of this tumor is that it is most frequently encountered in the female (89 per cent).[1,11] Most cases occur in the middle age group.

In 1947 Benson and Gordon,[2] in reviewing the literature, were able "to compile only 27 surgically explored cases of cystadenoma of the pancreas." They also reported one case of their own. Of this group, the tumor apparently was excised completely in twenty-one cases. In the same year Bravo[3] reported eleven cases of cystadenoma of the pancreas. Complete excision was accomplished in six of these cases. Since 1947 eleven other cases of cystadenoma of the pancreas with excision have been reported in the literature. There was one death in the total of thirty-nine cases. Our case brings the number of cystadenomas of the pancreas which were totally excised to forty.

The symptomatology of this condition is vague. The patient's only complaint, as in our case, may be the presence of an abdominal mass. As the tumor enlarges, it may become tender and painful. As it encroaches on neighboring organs, gastrointestinal symptoms may develop such as anorexia, nausea, vomiting, constipation or diarrhea and subsequent weight loss.[8,9] Symptoms of biliary tract disturbance are uncommon. The tumor mass is usually located in the epigastrium or left hypochondrium and is firm, irregular and quite frequently freely movable. X-ray studies of the gastrointestinal tract may demonstrate extrinsic pressure defects on the stomach.

Because of the multilocular character of this tumor and possible malignancy, complete excision is the treatment of choice.[7]

CASE REPORT

A thirty-nine year old white woman was admitted to the hospital on April 6, 1953, with the chief complaint of a lump in the abdomen of approximately four years' duration. The only symptoms referable to this lump were that at night she experienced an occasional thumping sensation in the abdomen and that sometimes the mass ached. The mass had gotten larger during the year prior to admission. There was no history of trauma. Review of systems was normal.

Physical examination did not reveal any abnormality other than a 12 by 14 cm. firm ovoid abdominal mass which was non-tender and which was located in the left hypochondrium. It was quite mobile and could be moved to the midline and to the left lower quadrant. At times it would retract beneath the left subcostal margin.

The preoperative blood count and urinalysis

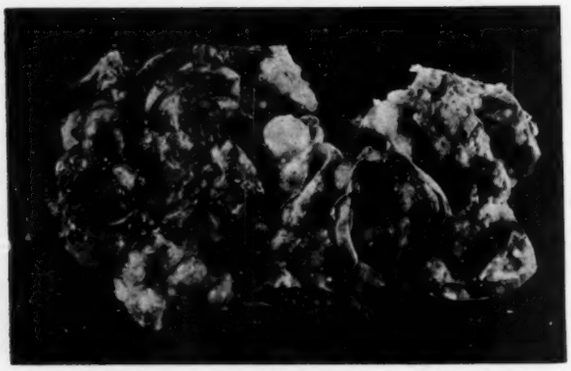
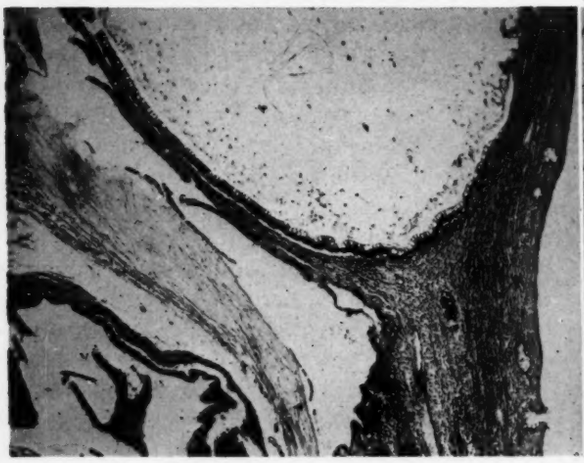


FIG. 1. Tumor opened (Armed Forces Institute of Pathology, Neg. No. 53-13264).

cyst was entertained and an attempt was made to aspirate it. The material, however, was extremely thick and contained much amorphous yellowish debris that could not be aspirated. The cyst was delivered outside the abdomen and packed off. Its anterior surface was opened and the material inspected. It consisted of many cysts of varying sizes with small papillary projections lining many of them. It reminded one of a malignant cystadenoma of the ovary. A diagnosis of cystadenoma of the pancreas, possibly malignant, was made and it was decided to resect the tumor completely. Accordingly, the area of



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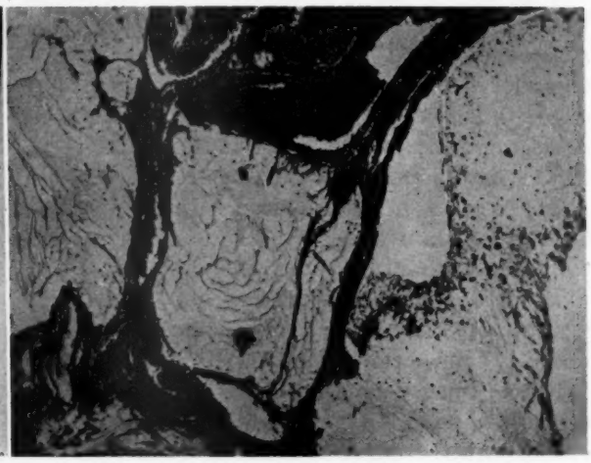

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FIG. 2. Photomicrograph of multiloculated mucinous cystadenoma of pancreas. The cysts are lined by columnar mucinous epithelium and are filled with mucus. × 48. (Armed Forces Institute of Pathology, Neg. No. 53-17744).

FIG. 3. Low power view of cystadenoma of pancreas showing multiloculated structure. Some of the cysts are lined by columnar mucous epithelium, while others are filled with mucin but are lined only by connective tissue. Some of the mucin has dissected between connective tissue fibers. × 48 (Armed Forces Institute of Pathology, Neg. No. 53-17713).

were normal. A gastrointestinal series revealed an extrinsic pressure defect on the antral portion of the stomach.

On April 7th a laparotomy was performed through a left upper rectus muscle-splitting incision with the patient intubated and receiving pentothal,® nitrous oxide and ether anesthesia. In the lesser peritoneal sac there was a firm multiloculated mass measuring approximately 6 by 5 by 3 inches. The tumor was approached by opening the greater omentum. The tumor was found to be retroperitoneal. The overlying peritoneum was incised at the lower border and the mass was easily enucleated except for a 2 by 1 inch area where it was firmly attached to the pancreas just to the left of the mesenteric vessels. A diagnosis of pancreatic attachment to the pancreas was excised, taking out a margin of normal pancreatic tissue. The mesenteric vessels coursed immediately along its right border but all gross evidence of tumor was removed. The pancreas was reperitonealized and two rubber tissue drains were placed in the region of the resected part of the pancreas and brought out through a stab wound lateral to the incision. The abdomen was closed.

The pathologic report revealed the tumor to be a multilocular mucinous cystadenoma measuring 15 by 11 by 16 cm. (Fig. 1.) There were numerous cysts lined with mucinous columnar epithelium, enteric in type. This placed the tumor in the enterogenous type of Bravo. (Fig. 2.) The cysts were filled with

mucin and epithelial debris. There was much interstitial hemorrhage and mucinous infiltration of the scant fibrous stroma (Fig. 3) with cholesterol deposition and associated chronic inflammation with foreign body giant cells. The mucinous infiltration may indicate malignancy. Diagnosis: mucinous cystadenoma of pancreas.

Postoperatively the patient complained of upper abdominal and back pain and was unable to retain fluids for the first three days. On the first postoperative day the blood amylase value was 460 units. By the seventh postoperative day it had decreased to 297 units, and by the fifteenth postoperative day to 126 units. After the fifth postoperative day the patient began to feel quite well. Clear liquid drainage appeared through the drainage site on the seventh postoperative day. The discharge did not irritate the skin. (Pancreatic juice must be activated in the gut before it has this property. Amylase and lipase must be activated by bile before they will digest tissue.[17] This fact points to the regurgitation of bile into the pancreatic ducts as necessary for the production of acute pancreatitis.) On the eighth postoperative day the drains were removed. When the drainage ceased on the eleventh postoperative day, the patient began to complain of pain in back and upper abdomen. Spontaneous drainage resumed on the thirteenth postoperative day with cessation of pain. By the fifteenth postoperative day the drainage again stopped. The patient remained comfortable and was discharged on the next day. She has remained asymptomatic and well healed without drainage.

SUMMARY

A case of cystadenoma of the pancreas with surgical removal is described and a brief review of the literature is presented.

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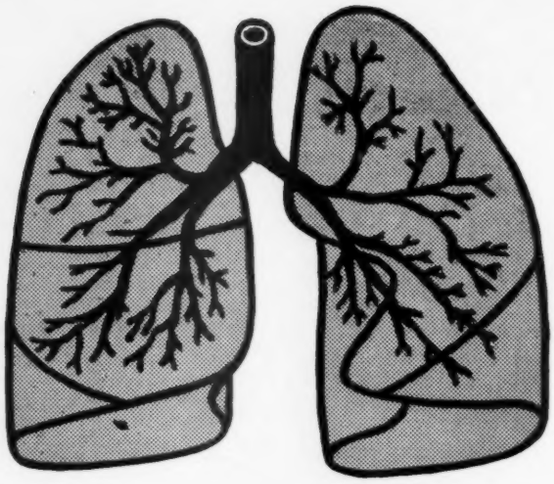

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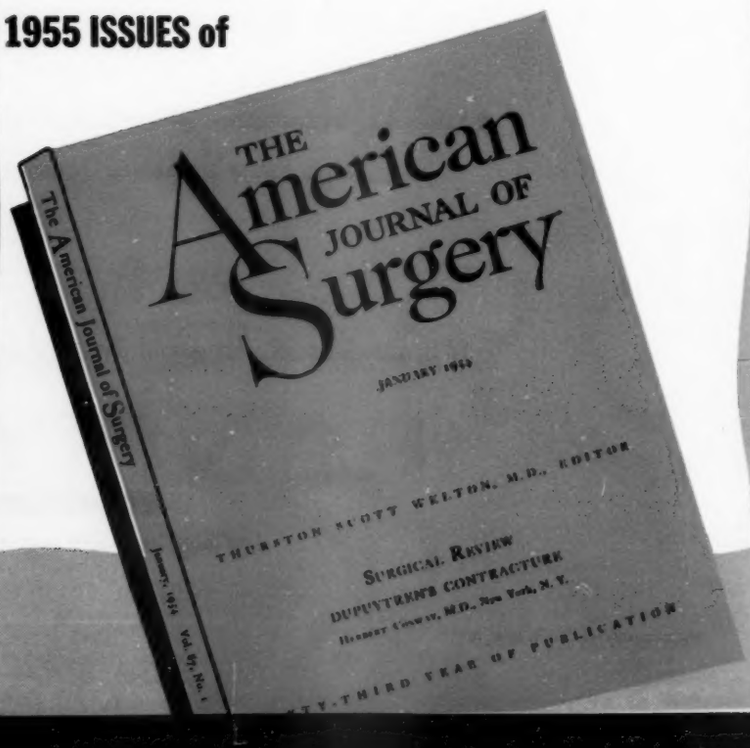

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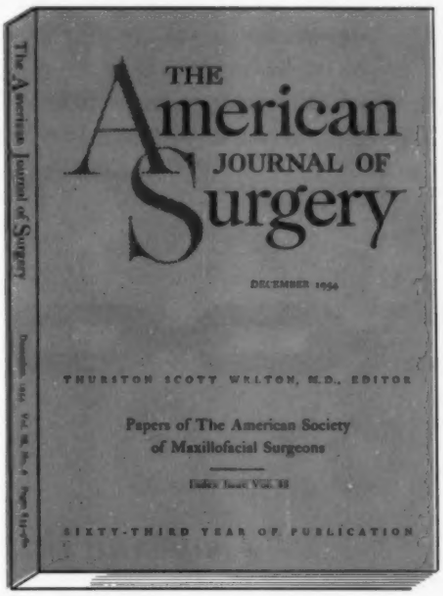

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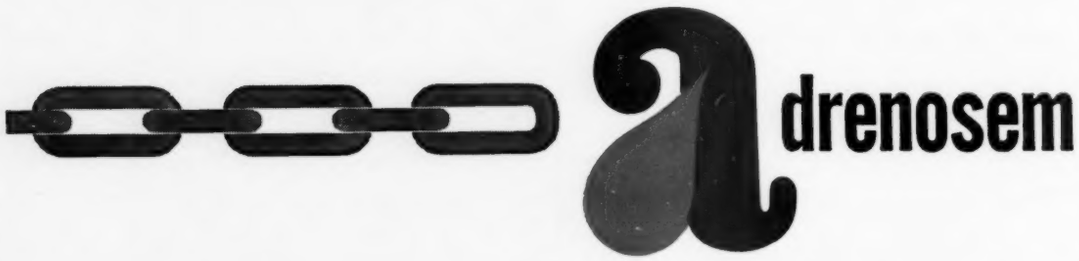
*Sherber, D. A.: The Control of Bleeding, Am. J. Surg. *86*:331 (Sept.) 1953.



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- *postoperatively* to prevent hemorrhage and check oozing: one to two ampuls (5 to 10 mg.) every two hours until there is no indication of undue bleeding. To maintain control, one ampul may be administered every three hours or 1 to 5 mg. orally t. i. d.
- to control *active bleeding:* One ampul (5 mg. every two hours until bleeding is controlled; frequency of dose may then be diminished.
- to control *severe bleeding:* one ampul (5 mg.) every hour for three doses; then every three hours until bleeding is controlled.
- to control *mild, low-grade bleeding:* 1 ampul (5 mg.) every three or four hours until bleeding is controlled; then 1 to 5 mg. orally four to five times daily until bleeding ceases.
- *maintenance dosage* to prevent bleeding in conditions where small vessel integrity may be impaired: 1 to 5 mg. orally t. i.d.; if bleeding ensues, dosage may be increased 1 to 5 mg. orally every three or four hours; if bleeding persists, oral dosage should be supplemented with 1 ampul (5 mg.) daily.
- *pediatric dosage:* up to four years of age – 1 mg. intramuscularly or orally with same frequency as for adults, until bleeding is controlled. From four to twelve years of age – ½ the adult dosage as indicated.

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Tablets: 2.5 mg. S. C. Yellow, bottles of 50.

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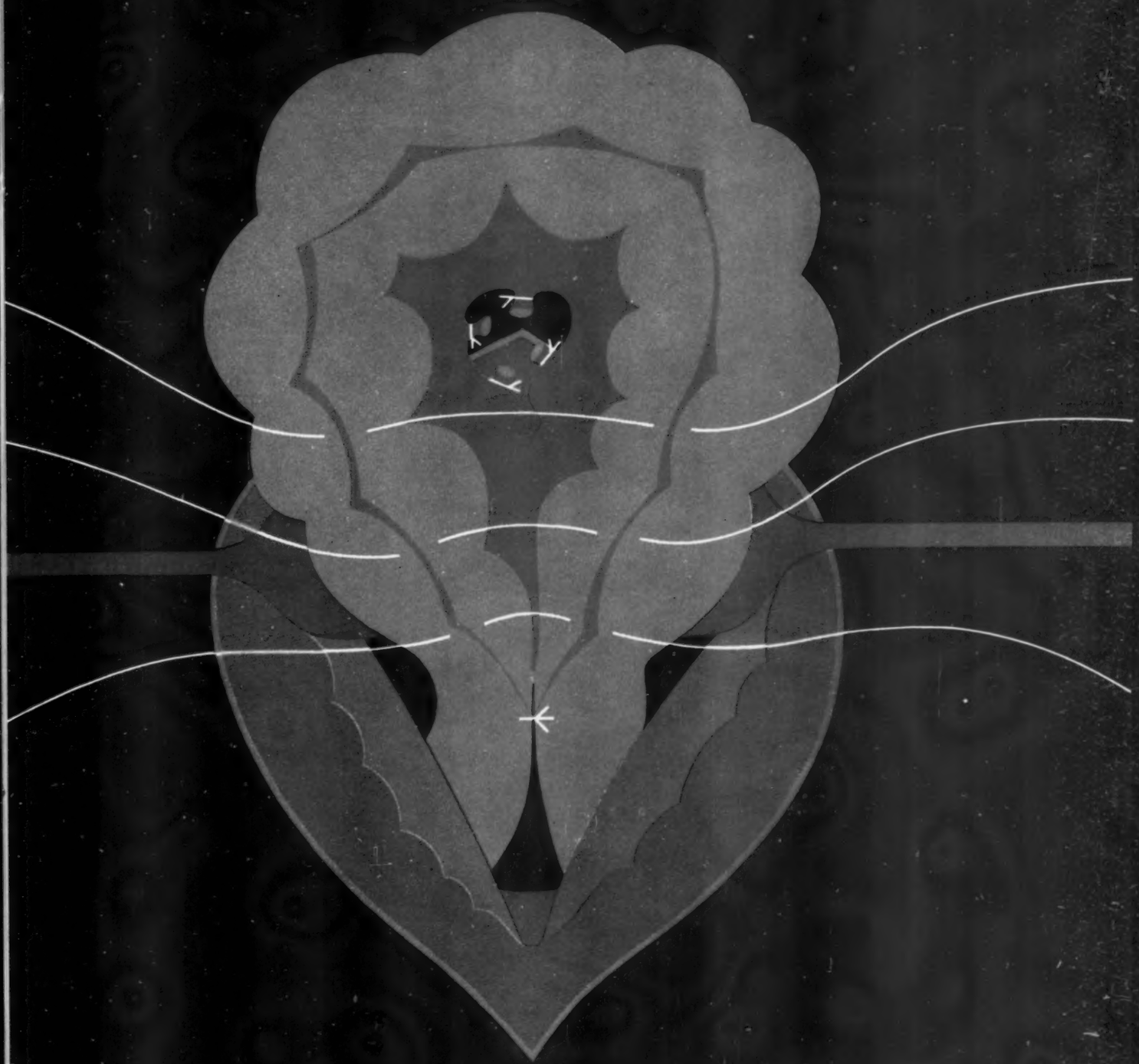

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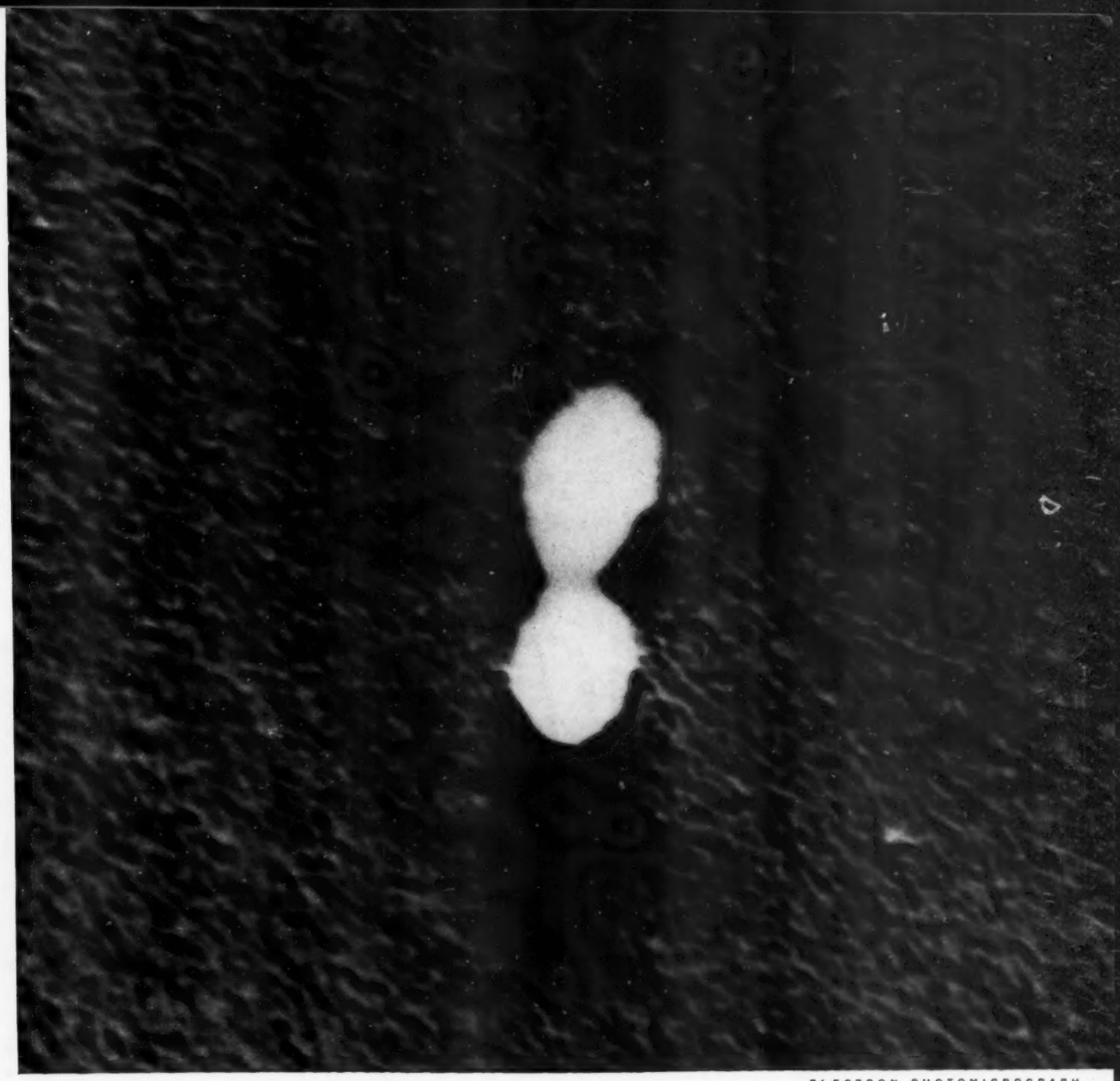

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NOTES AND QUOTES

A YALE professor said that smoking cigarettes may possibly be responsible for heart disease as well as cancer. But, and it is a big "but," there is no specific proof that the use of tobacco causes cancer, heart disease or serious ailments, according to E. Cuyler Hammond, professor of biometry at Yale University.

Prof. Hammond, who is also director of statistical research for the American Cancer Society, in discussing tobacco and health, pointed out that "the death rates from heart disease have been increasing steadily for the last several decades" and that the popularity of cigarettes has also been on the rise in that period. Even taking into account the increasing age and greater vulnerability to heart disease of the population, "death rates from coronary thrombosis appear to have about doubled in the last twenty years or so," said the Yale biometrist who applies the science of statistics to biology and public health.

Smoking is known to cause "an increase in the heart rate, an increase in blood pressure, and a constriction in the size of the small blood vessels," he continued. While none of this proves that cigarette smoking causes death from heart disease, it does constitute "sufficient evidence to warrant doing further research on the subject," Prof. Hammond said.

He went on to explain that there is no positive proof yet that cigarette smoking causes lung cancer. Many other factors in our environment, he insisted, should be investigated as possible causes for the startling jump in lung cancer during the last twenty years. For instance, he explained, soot and fumes from oil furnaces and from motor vehicles both "are inhaled by human beings—and both contain substances which can be used to produce cancer in experimental animals." He added that it is possible that "lung cancer may be caused by the combined effects of cigarette smoking and air pollution."

The Yale statistician described an experiment in which material was collected from cigarette smoke and applied to the skin of mice every day for many months. "Forty-one percent of the mice developed skin cancer," he reported, adding, "Note that I say skin cancer. This is a far cry from the production of lung cancer in men by the inhalation of cigarette smoke."

He went on to say that in surveys already conducted, a much larger percentage of lung cancer patients confessed to heavy cigarette smoking than did other groups of people similarly questioned. The trouble with such surveys, he pointed out, is that "the emotional effect of having a deadly disease might perhaps tend to make lung cancer patients give exaggerated or otherwise unreliable answers to questions about their smoking habits."

Prof. Hammond said that experimental studies in which animals are being exposed to cigarette smoke to see if they develop lung cancer and in which cigarette smoke is being analyzed in an attempt to isolate some specific cancer-producing agent as well as statistical studies in which smoking habits of 204,000 people are being correlated with death rates from various causes may answer the big questions about cigarette smoking.

A first aid "specific" dressing for injuries on knuckles or fingers, especially finger joints, has been manufactured by Medical Fabrics Co., Inc. of Paterson, New Jersey. "Knuckle-Bands" are a time- and labor-saving addition to ordinary first aid material for they can be applied quickly, securely held and yet permit free movement of injured parts.

Flex-Aid Knuckle Bands are made of flesh-colored elastic cloth which expands and contracts with every movement of the joint or body and does not cause constriction. These sterilized, individually wrapped adhesive dressings are somewhat porous, therefore reducing the danger of maceration of bandaged parts.

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NEW technics for liver surgery may result from studies reported to the American Association of Anatomists by Dr. John E. Healey, Jr., of Jefferson Medical College, Philadelphia. Dr. Healy told the assembled anatomists that although operations for removal of portions of the liver have been performed since 1886, they are relatively crude since surgeons have lacked knowledge about blood and bile circulation within the liver. To learn more about this

CONTINUED ON PAGE 48

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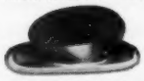

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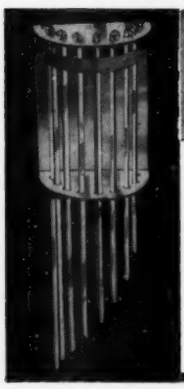

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circulation within the liver, Dr. Healy reported how he had injected a vinyl acetate solution into bile ducts, hepatic arteries and portal veins, and followed the flow patterns. He discovered that all three of these systems were arranged by fissures into segments, and that all three followed each other very closely. However, the hepatic veins did not follow this segmental arrangement. The main trunks of these veins were found between the liver segments, draining segments adjacent to them. The hepatic veins are one of the four main channels of circulation in the liver; the bile ducts, hepatic arteries and portal veins being the other three.

By establishing an anatomic pattern within the liver, Dr. Healey hopes to make it easier for surgeons to perform operations on the liver and to increase the safety of such operations.

An evaluation of the effects of robalate®, donnatal® and donnalate® on gastric secretion and gastrointestinal motility in peptic ulcer patients is being made in Chicago under the direction of Dr. Clifford J. Barborka, associate professor of medicine, Northwestern University Medical School, and senior consultant in gastroenterology to the Veterans Research Hospital, and Dr. E. Clinton Texter, associate in medicine, Northwestern University Medical School.

Dr. W. R. Bond, director of clinical research of the A. H. Robins Co., Inc., Richmond, Virginia, said the grants cover a six-month pilot project at the Medical School outpatient department of gastroenterology, and a three-year project to explore the mechanism of pain in ulcer.

SIMPLE forms of urinary infections usually can be treated successfully by sulfonamide therapy, according to Drs. Houston D. Everett and John Herman Long of Johns Hopkins University and Hospital in the April, 1954, issue of the *American Journal of Obstetrics and Gynecology*.

"The preferred agents for the initial treatment of urinary infection of all varieties should be one of the sulfonamide drugs," the Baltimore physicians concluded on the basis of 1,916 urine cultures studied over a period of three years. They favored sulfonamides over antibiotics because of lower costs, effectiveness against a greater variety of organisms and fewer unpleasant side effects

Antibiotic therapy, they reported, should be reserved for the more complicated and serious infections or those that have proved resistant to sulfonamide therapy. They found sulfadiazine in small doses, 2 gm. daily, proved effective in acute uncomplicated infections in five to seven days.

A team of Cincinnati doctors reported "striking response" with a newly developed therapeutic vitamin cream, panthoderm, in speeding the healing of stubborn, chronic skin diseases, many of which had failed to improve under prolonged treatment with other drugs.

Dr. Ashton L. Welsh and Dr. Mitchell Ede, reporting in the American Medical Association's Archives of Dermatology and Syphilology, said twenty-five of a group of twenty-eight patients with a wide range of chronic skin diseases ranging from hypostatic dermatitis, atopic dermatitis and neurodermatitis to leukoplakia and seborrheic keratoses showed faster, often striking improvement. These patients "evidenced stimulation of epithelization (growth of epidermal, or outer, tissue), a resolution of maceration, healing of fissures and excoriations" when the panthoderm cream was employed externally. The investigators were also impressed with the way the new cream controlled the itching which accompanied many of these skin ailments.

DR. ALEXANDER R. SURREY, senior research chemist at the Sterling-Winthrop Research Institute, Rensselaer, New York, has been elected chairman of the Eastern New York Section of the American Chemical Society. He will serve in that position until May, 1955.

Dr. Surrey is the author or co-author of more than fifty publications and patents dealing with organic syntheses. Included in his work is synthesis of the antimalarial aralen® (chloroquine), and the development of a process for its production. His most recent publication concerns synthesis of a group of powerful new amebicidal agents. He is also the author of a book on organic chemistry, "Name Reactions in Organic Chemistry," published earlier in 1954 by the Academic Press, Inc., New York. It was written by Dr. Surrey to fill the need for

CONTINUED ON PAGE 50

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Adult Set sizes 1, 1½, 2, 3,—for stretching anal sphincter.
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NOTES AND QUOTES

a sharpened, up-to-date compilation of name reactions, one of the important tools of the organic chemist. These are the reactions designated by the names of the individuals who discovered or developed them, conforming with time-honored custom in chemical literature.

Despite its triumphs and miracles, modern medicine has failed. It has neither eliminated disease nor promoted health, according to Dr. Iago Galdston of the New York Academy of Medicine. This seeming paradox is vividly demonstrated in his new book "The Meaning of Social Medicine," published in May by Harvard University Press.

Not to be confused with socialized medicine, which is the provision of certain medical services by the government, social medicine is concerned with a wider view than mere "curative" medicine. It scrutinizes many factors affecting health and well-being. Its emphasis is upon man and his environment rather than disease and its etiology. [*Recommended. Ed.*]

VITAMIN deficiency is now known to be among the causes of at least eleven nervous or mental disorders, according to a report in *The Journal of Clinical Nutrition*. Disorders listed involve such symptoms as mental deterioration or depression, hysteria, defective memory, loss of sense of location, loss of sense of truth, hallucinations, ideas of persecution, anxiety, irritability, etc.

Authors of the paper, which is a summary of research on the role of vitamins in nervous and mental disease, are Dr. Robert A. Peterman, medical director of J. B. Roerig and Co., Chicago, and Dr. Robert S. Goodhart, scientific director of the National Vitamin Foundation, New York. Both have contributed to the advance of clinical nutritional research as members of the Nutritional Clinics of the New York City Department of Health.

Their report summarizes seventy-four studies, of which sixty have been published since January, 1950. A major purpose of the summary is to make these new findings available to the practicing physician by describing the signs and symptoms of otherwise undetectable disorders and suggesting one or more vitamins as therapy for the conditions involved.

Dr. Silvio de Sao Paulo has joined Wyeth Laboratories as a clinical associate, it was announced recently. Dr. de Sao Paulo formerly served as a major in the U. S. Army Medical Corps as chief of the Preventive Medicine Section, 1st Army Corps, Korea.

A graduate of the school of medicine of the University of Bahai, Brazil, Dr. de Sao Paulo also received a doctor's degree in public health from the University of Brazil. He took his master's degree in public health at Yale University. During his Army career Dr. de Sao Paulo served in the Caribbean and Far East theaters where he was awarded the Presidential Unit Citation and the Bronze Star Medal. He is a member of the Association of Military Surgeons.

THE published studies on the antimicrobial nitrofurans are so voluminous by now that Eaton Laboratories at Norwich, New York, where this new family of drugs was discovered, has established a reference library as a service to its staff and to independent investigators. Undoubtedly the only complete collection of the nitrofurans literature in existence, it consists of 894 original articles in seventeen languages, not including abstracts and mentions. Items on furacin®, furaspor®, furoxone®, furadantin® and other nitrofurans are constantly being added from clinical and veterinary journals and those devoted to chemistry, biochemistry, bacteriology and biology, published throughout the world. A mimeographed bibliography is available to investigators, and queries are answered with the aid of a card index system with cross reference cards to all phases of published work on the nitrofurans anywhere in the world.

Shock was successfully controlled in five hypotensive patients following infusions of neosynephrine hydrochloride®, with no unusual reactions noted despite "prolonged and continuous intravenous administration" of the vasopressor drug, it was reported in the March, 1954, issue of the Bulletin of the New England Medical Center.

Blood volume had been restored in each patient, but had failed to reverse the acute hypotension, according to Dr. Harold Rheinlander and his

CONTINUED ON PAGE 52

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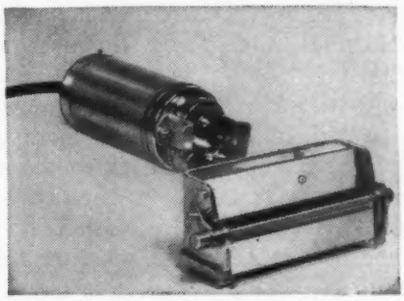

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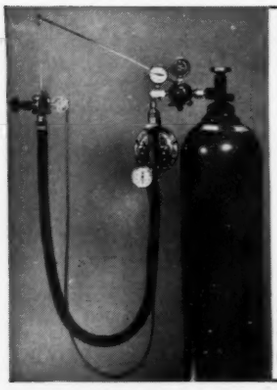

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NOTES AND QUOTES

associates. They are affiliated with New England Center Hospital and Tufts College Medical School.

In two patients with shock due to massive hemorrhage, prompt and continued therapy with neo-synephrine reversed the shock condition and maintained blood pressure at normotensive levels "until the vasomotor center recovered." Previously, the doctors state, the pressure had not responded to adequate blood replacement.

THE outlook for medical education in America has been "visibly brightened" by events of the past few months, according to Charles H. Prange, President of Austenal Laboratories, Inc. and Chairman of the Hospital, Surgical and Optical Division of the Committee of American Industry. The CAI is spear-heading an appeal of the National Fund for Medical Education for an annual ten million dollars from industry to keep the nation's medical schools in business.

"Just before its adjournment the Congress passed and President Eisenhower signed a bill granting a Federal Charter to the National Fund for Medical Education," Mr. Prange said. "This stamp of Federal approval puts the National Fund on the same plane with the Red Cross and other great public agencies, a deserved acknowledgment of its importance to the national welfare. It emphasizes the fact that medical training in America is a basic national resource.

"At almost the same time," Mr. Prange continued, "the United States Steel Foundation announced its initial gift to the Fund of $50,000. So to Federal recognition is added that of one of the nation's largest industries in marshaling business support of medical education. While not unique—there have been other corporate gifts of like size—Big Steel's action will be a pace-setter for other business firms, large and small."

Mr. Prange pointed out that the National Fund distributed $2,176,904 to the nation's eighty medical schools last summer, bringing to $7,000,000 the grant distributed since the Fund's founding in 1949. But the annual goal, he added, is $10,000,000, which he described as the minimum to keep the medical schools above water without seeking Federal subsidy.

After using mycifradin (neomycin) to reduce the bacterial flora of the intestines of fifty patients before they underwent surgery, a group of Army surgeons have termed this antibiotic, "the most effective antibiotic available for intestinal preparation."

The physicians from the Surgical Research Unit of the U. S. Army at Fort Sam Houston, Texas, praised neomycin for its low rate of absorption from the bowel, its wide range of activity against the bacteria of the gut and the low incidence of bacterial resistance encountered with the drug to date. Their report appeared in a recent issue of Surgery.

In their tests the Army doctors found that 4 gm. of neomycin in a single dose completely suppressed coliform bacteria, staphylococci and other gram-positive bacteria for twenty-four hours. The patients were first given enemas and a laxative in order to enable the neomycin to work more effectively.

The investigators conclude, "Neomycin effectively suppressed all intestinal bacteria in this series without evidence of the development of resistant forms. Overgrowth of yeast or fungi was not evident. Toxicity from absorption of the drug did not occur."

THE AMERICAN JOURNAL OF MEDICINE, since 1946 an internationally known, independent monthly publication, has been honored as recipient of the Honor Award, Class II (medical specialty journals) for Distinguished Service in Medical Journalism given by the American Medical Writers' Association. The award, consisting of a plaque, was accepted by its Editor, Dr. Alexander B. Gutman of New York City, Professor of Medicine, Columbia University, and Director of Medicine, Mt. Sinai Hospital, New York. The presentation was made by the President of the Association on the occasion of the 11th Annual Meeting of the Association held in Chicago on September 24th. The award is one presented annually "for accuracy, clarity, conciseness and newness of information in articles, editorials, and other material; for excellence of design, printing and illustrations, and for distinguished service to the medical profession," rendered by United States and Canadian medical periodicals.

CONTINUED ON PAGE 54

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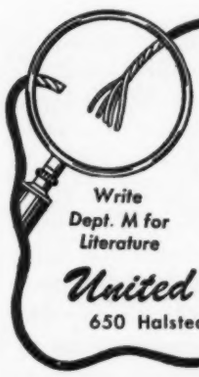

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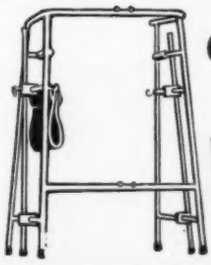

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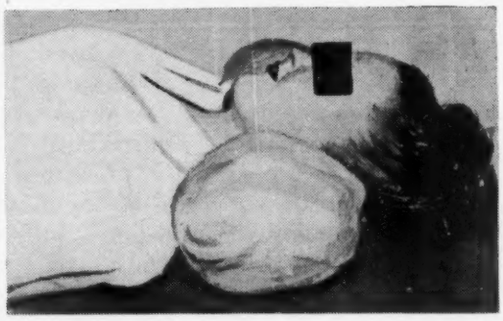

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NOTES AND QUOTES

In the past two decades, major gains have been made in reducing mortality among children five to fourteen years of age. The death rate dropped nearly two-thirds between 1933 and 1953—from 158.0 to 57.3 per 100,000—among boys of elementary school age insured under Industrial policies in the Metropolitan Life Insurance Company. Among the girls the downward trend in mortality was even more marked, the rate falling from 125.8 to 36.8 per 100,000. In each sex decreases of 85 per cent or more were recorded in the death rate from a number of diseases, including the principal communicable diseases of childhood, appendicitis, pneumonia and influenza, and tuberculosis.

Despite these striking achievements in life conservation, the actual number of lives lost among school-age youngsters is still large, a considerable part of it resulting from causes amenable to control. At present there are about 15,000 deaths a year among children of ages five to fourteen in the general population of the United States. Accidents are the greatest single menace to child life. Among the boys accidental injury was responsible for more than two-fifths of the total mortality in 1950; among the girls the proportion exceeded one-quarter. The wide disparity in the accident death rate between boys and girls—31.5 and 13.5 per 100,000, respectively—accounted for nearly the entire sex difference in the total mortality.

Malignant neoplasms (cancer and allied conditions), which two decades ago were a relatively minor cause of death among children five to fourteen years of age, now outrank every other disease as a cause of death in this period of life. These conditions have forged ahead to their present rank not only because of the marked decrease in the mortality from the infectious diseases, but also because of the increase in the recorded death rate from cancer. The leukemias account for nearly half of all the deaths attributed to malignancy among school-age children.

RESEARCH grants of $15,000 to the University of Illinois and $3,000 to the University of California have been announced by The Upjohn Company. The department of chemistry at Illinois will receive $9,000 to support work on the chemistry and preparation of antibiotics. This project is under the supervision of Dr. Herbert E. Carter. At the same university research on antibiotics in the department of horticulture is being aided by a $6,000 Upjohn grant to be used under the direction of Dr. David Gottlieb.

Dr. James Halsted of the University of California has been awarded $3,000 by Upjohn to continue his studies on vitamin B_{12}.

Furadantin® is a useful chemotherapeutic agent in combatting "surviving strains from other medications since these strains soon become the dominant infecting organisms," Dr. Grayson Carroll and Dr. Robert V. Brennan of the St. Louis University Medical School stated in the May, 1954, issue of Journal of Urology.

The investigators found furadantin "particularly useful in the stubborn Proteus infections," and likewise effective in the majority of strains of Escherichia coli, Aerobacter aerogenes, Streptococcus faecalis and Alcaligenes sp. "Its effectiveness in Proteus infections has been most encouraging and valuable since the Proteus causes recurrent stone formation and encrustations," they report.

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DR. PATRICK H. HANLEY, instructor in the Tulane University School of Medicine, has been awarded the Ohio Valley Proctology Award for the best paper presented at the 53rd Annual Meeting of the American Proctologic Society held in June at Los Angeles, California.

Dr. Hanley received the award for his paper on surgical correction of anal deformities in babies at birth. A native of Lockport, Louisiana, Dr. Hanley is a 1933 graduate of Tulane. He is a staff member of the department of surgery, Ochsner Medical Foundation.

The Ohio Valley Award is presented annually to an affiliate member of the American Proctologic Society whose paper is judged the best of those presented at the yearly meeting of the group.

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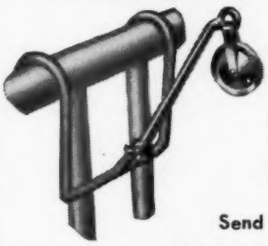

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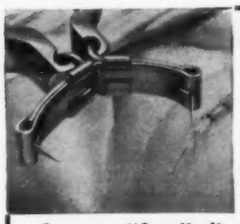

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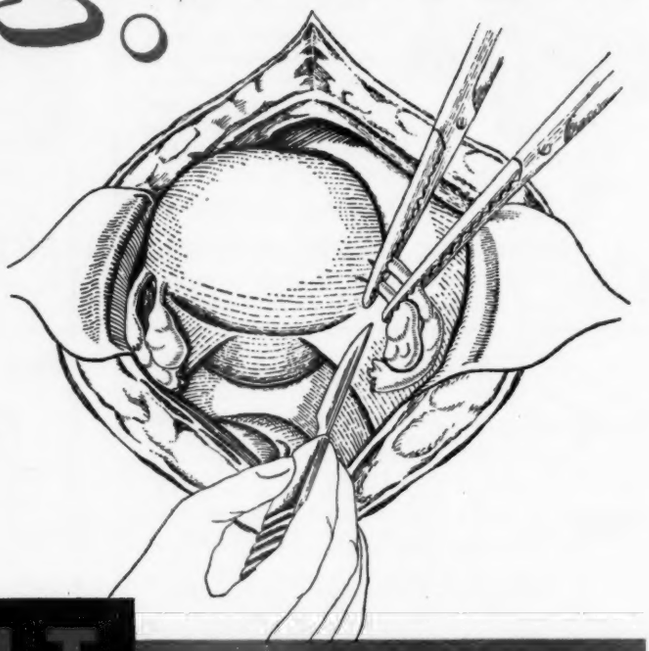

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